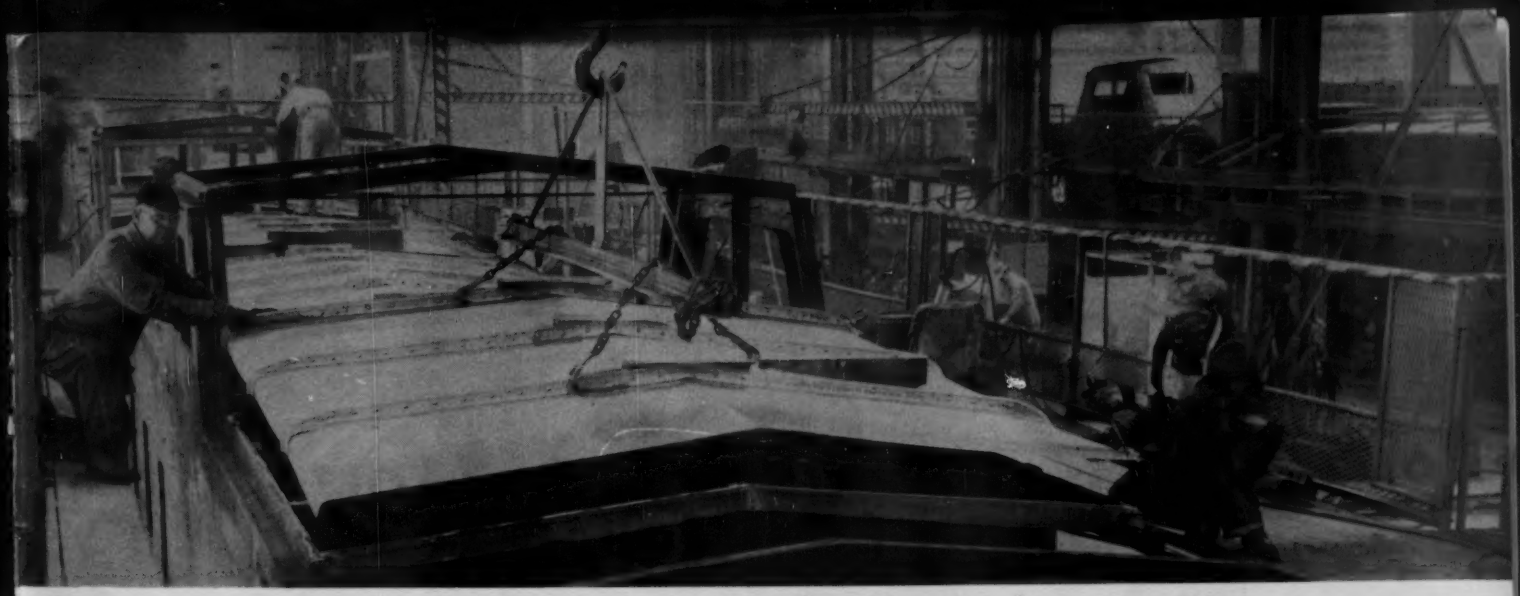


Box and Caboose Cars Get Aluminum Roofs... Page 10

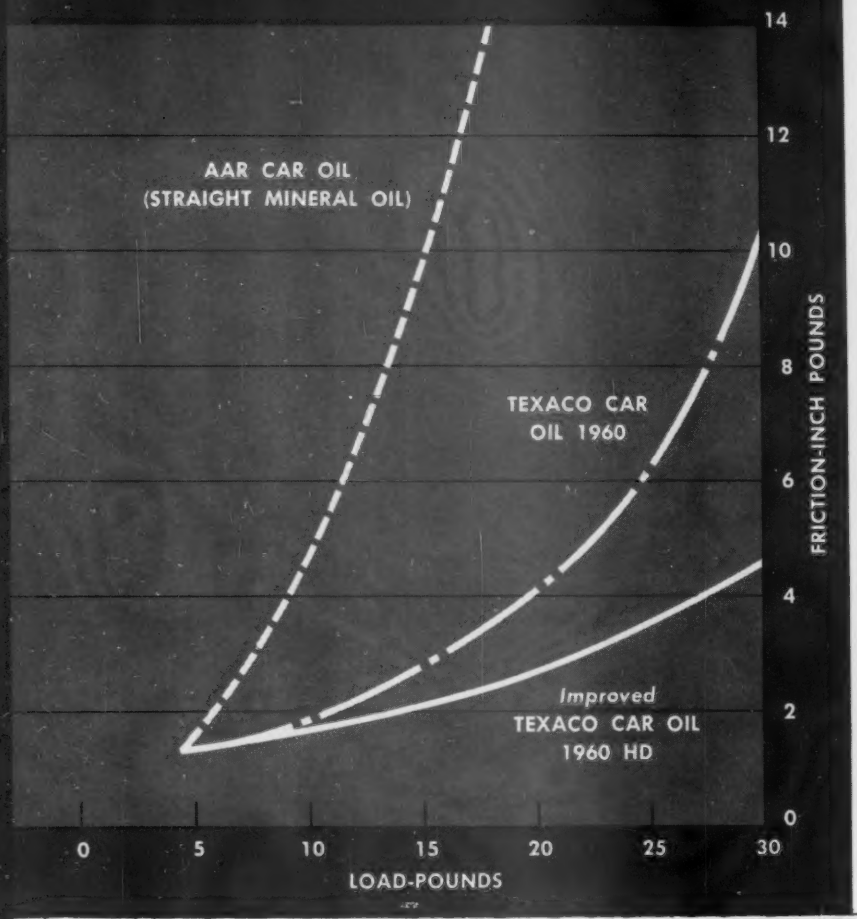
RAILWAY
# LOCOMOTIVES AND CARS

A SIMMONS-BOARDMAN TIME-SAVER PUBLICATION MAY 1958

# DIRT IN DIESELS

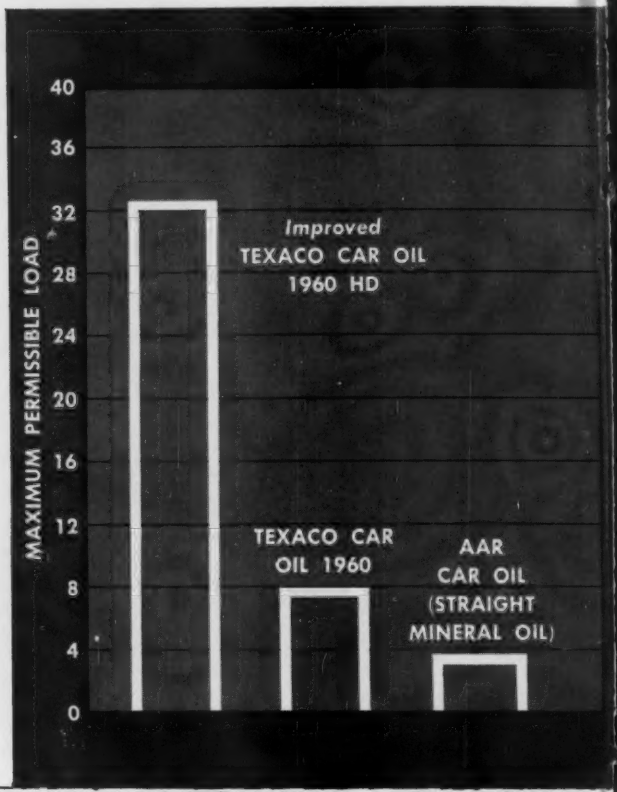
## What it does... What it costs

## What you can do... page 29




**IMPROVED FRICTION CHARACTERISTICS** of Texaco Car Oil 1960 HD are graphically illustrated here. Small-scale testing equipment used AAR babbitt and steel pins.

**HIGH WEAR RESISTANCE** of new Texaco Car Oil 1960 HD makes possible extremely heavy loads. Special additives prevent mass shifting of babbitt under stress.



## Comparison tests prove Texaco Car Oil 1960 HD

# CUTS HOTBOX RATE

Real differences do exist among car oils. Wicking rate, load-carrying capacity and friction characteristics, all affect lubricant performance, and consequently, hotbox rate.

**New and improved Texaco Car Oil 1960 HD** is an optimum combination of the above three characteristics. In addition to the lab results shown here, actual field tests on leading railroads have already indicated the new oil's superiority.

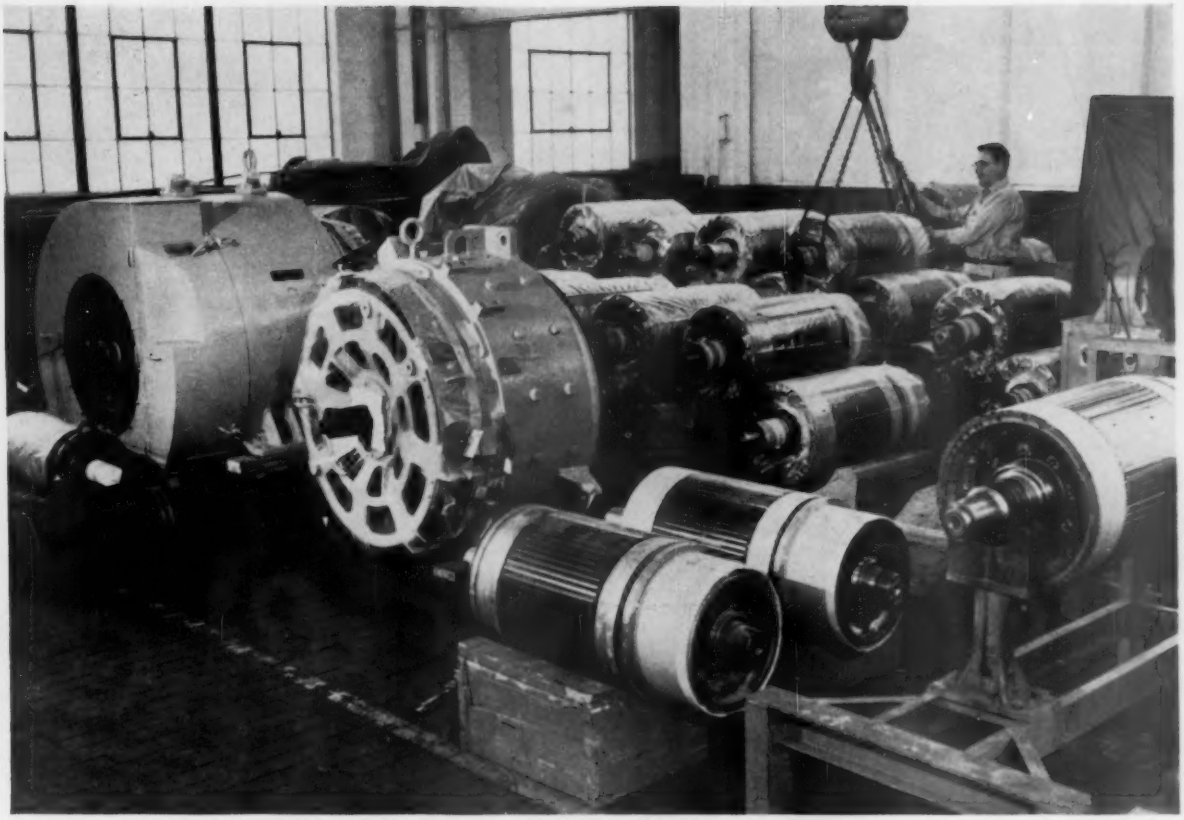
**Special additives are responsible** for this performance record. To prove the additives' anti-friction properties, for example, Texaco development engineers used a unique railroad journal bearing test machine. Adjusting this equipment to severe conditions, they operated it on an ordinary AAR non-additive car oil to establish a coefficient of friction of 0.1. Then while the machine was still in operation, the oil supply was changed over to Texaco Car Oil 1960 HD – and the coefficient of friction dropped to .005!

**Ask your Texaco lubrication specialist** for a complete report of Texaco Car Oil 1960 HD – and let him show you what it can do for your operation. Or write:

The Texas Company, *Railway Sales Division,* 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)



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National's unit exchange stock includes many types of traction motors, generators and extra armatures which can be shipped the day your order is received. All have been rewound to National standards of quality . . . which we believe to be the highest available to the railroad industry.

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For complete details on how National can help you solve your electrical maintenance problems, just call your nearby National field engineer or drop us a line.

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ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

# "When You Work for a Man, for Heaven's Sake WORK for Him"

Thus an American philosopher* packed a volume into one short sentence.

Really, if you can't feel that way about your job, the company's wrong or you are miscast in your work. Either way, see to it that you're *happy* doing a heaped-up-and-running-over kind of job.

The same point of view applies to a manufacturer's relations with his customers. We at Adlake like "workin' on the railroad". While we are human, and make mistakes, we like to think that we are doing a well-above-average job for our boss.

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THE ADAMS & WESTLAKE CO.

*Elbert Hubbard*

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RAILWAY
# LOCOMOTIVES AND CARS

The Oldest Trade Paper
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TIME-SAVING IDEAS FOR **MAY 1958**

Volume 132 • No. 5

## MOTIVE POWER AND CAR

## ASME-AIEE CONFERENCE DISCUSSES DIRT IN DIESELS:

**Dirt in Diesels Costs $138,733,385 Yearly** 29
*J. W. Horine, electrical engineer, Pennsylvania, estimates the cost of removing dirt from locomotives and the price paid for that which gets in.*

**How Much Air Filtering Can You Justify?** 30
*Railroads cannot afford to keep all dirt out of their locomotives, but some additional filtering may easily pay for itself.*

**Electrostatic Precipitator Cleans Engine Air** 32
*B&O has conducted two years of road tests proving that this novel filtering system can be successfully operated on a locomotive.*

**How Much Cleaning Can You Afford To Do?** 34
*The secret of economical locomotive cleaning is to do only that necessary, at the proper location, and at the right time.*

---

**Pete's Average Goes Down** 37
*A perplexing mechanical refrigerator car problem is solved in only a few minutes when Pete gets there.*

**Union Pacific Tests Pullman's PAT Piggyback** 38
*Pullman-Standard and Trailmobile have teamed up to produce a new container concept which is now undergoing its first tests.*

**NYC Begins Flexi-Van Operations** 39
*New York Central finally begins piggybacking with novel container-type equipment worth $8,000,000.*

**What Next for Solid Bearings?** 40
*Five steps which should improve the performance of the present standard journal bearing without excessive investment are discussed here.*

## ELECTRICAL

**Portable Control for Locomotives** 48
*Canadian Pacific had this device developed as one step in its program to eliminate firemen from freight and switching locomotives.*

**DC High Potential Testing Has Been Improved** 50
*How to perform new insulation tests and how to interpret the results are both important to men doing motor and generator maintenance.*

**The Diesel Seemed To Be Starved for Fuel** 54
*Our Diesel Maintainer's Notebook shows how a road failure was caused and what can be done about it.*

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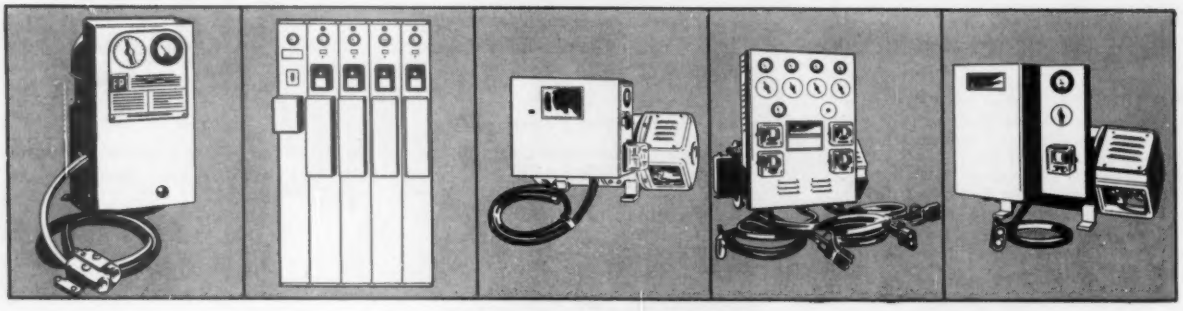
| Personal Mention | 14 | Supply Trade Notes | 56 |
| What's New in Equipment | 18 | Helps from Manufacturers | 68 |

# EXIDE TO MARKET ALL ELECTRIC PRODUCTS CO. CHARGERS



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Designed specifically for railroad use, the Type US Sperry Reflectoscope offers a faster, simpler, more accurate and more economical means of testing. Axles can be tested "in place" on locomotives or cars, resulting in major maintenance economies by detecting hidden flaws before they cause costly failures or breakdowns.

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*Complete portability... weighs only 35 pounds*

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*Simplified four-knob control panel*

*New, completely transistorized plug-in alarm system... eliminates possibility of human error*

*Bright . . . easy to read video presentation*

Sperry Reflectoscope Type US is another fine example of Sperry Rail Service's "engineering exclusively for railroads." If you're interested in cutting maintenance costs and achieving maximum equipment utilization, send for details of this outstanding inspection tool.

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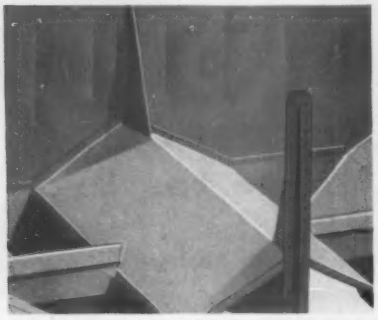
# DURABILITY

## another built-in benefit

THE PS-3 Standardized Open Hopper is a prime example of the reserve durability, the *extra* quota of trouble-free service built into the Pullman-Standard line.

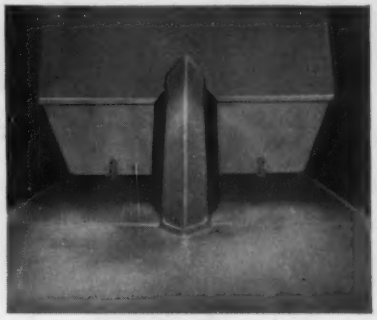
Hopper cars, in addition to normal hard service during interchange, must be able to stand up under sledge-hammer blows, shake-out machine and rotary dumper abuse, pounding from clam shells, plus the corrosion and abrasion caused by many types of bulk lading. Reserve durability in every part enables the standardized PS-3 to meet today's rugged demands, keeps it on the job day after day—ready to roll, capable of fast, efficient handling of all types of lading. And it holds future repairs to a minimum.

But reserve durability is only one built-in benefit—first cost economy, shipper acceptance, maintenance simplicity—all these and more are part of every P-S car. Write for copies of the booklets on each of the P-S line—PS-1, PS-2, PS-3, PS-4 and PS-5—they will give you complete details on each car and its benefits.



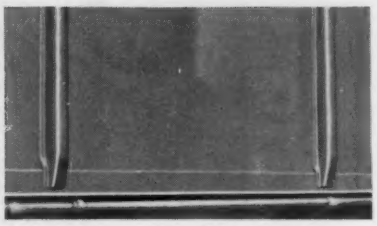
**Reserve Durability—Cross Ridge Brace**

The PS-3 inside cross ridge brace is formed of heavy 5/16" plate and, in combination with the side sheet and side post, forms an extremely strong section that contributes to floor support and prevents side bulging. Automatic arc-welding of floor sheets to the crossridge web and cap provides a well-supported surface in this vital area. Brace is solid, smooth and rounded to prevent damage from clam shell fouling.



**Reserve Durability—Strong Floor Sheets and Hopper Chutes**

PS-3 floor sheets are of 5/16" plate and outside hopper sheets are 3/8". Flanged floor sheet edge at sides and longitudinal hood junctions are joined by fillet welds. This provides a smooth, clean interior—free of sharp corners, ledges and ridges that retain corrosive lading. Heavy-duty hopper chutes gives positive resistance to damage from sledges and fires used in cold weather unloading.



**Reserve Durability—Welded Side Construction**

Outside location of side posts provides a smooth interior, greatly reducing corrosion possibilities and facilitating unloading. The PS-3 side posts are continuously and automatically arc-welded to the side sheets. In addition, they are arc-welded to the underside of the top chord—providing added resistance to shakeout machines. The 1/4" side sheets have vertical indentures to minimize flutter and increase service life of sides.

# PULLMAN-STANDARD

**CAR MANUFACTURING COMPANY**

SUBSIDIARY OF PULLMAN INCORPORATED

**200 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS**

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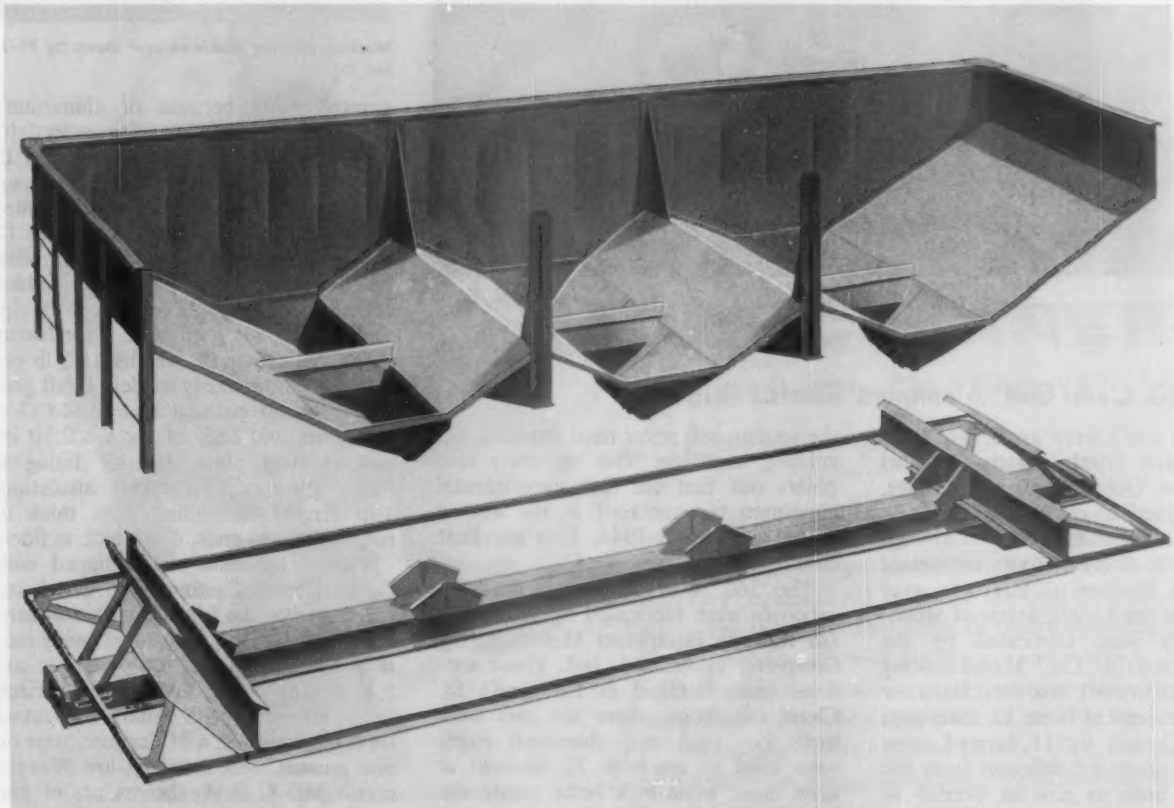
# IN RESERVE

## of P-S Standardized Freight Cars



## PS-3 HOPPERS

**have these other extras that provide reserve durability**

- Corners gain added strength from special inside corner band and cap.
- Hopper door frame is of strong, low-alloy, high-strength steel continuously welded to the outside of the hopper chute—mates with ⅜" formed hopper door providing tight, corrosion-resistant, long-lasting construction.
- Large bolster bottom flange and gussets provide a strong, durable center sill attachment which eliminates center sill shifting.
- Longitudinal hood is welded to floor sheet flanges eliminating danger of tearing common to butt fitted hoods All welds are smooth.

PS-3 available in 50-ton, 2143 cu. ft., 2-hopper and 70-ton, 2750 cu. ft., 3 hopper sizes.

# LOCOMOTIVES AND CARS REPORT FOR MAY

Thirty GN cabooses have aluminum roofs fabricated by the Standard Railway Equipment Manufacturing Company.

## Over 300 Cars Get Aluminum Roofs

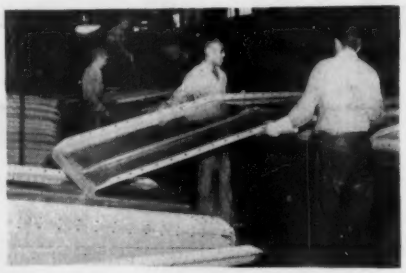
Aluminum roofs were applied recently to 300 Grand Trunk Western box cars and 30 new Great Northern cabooses. Alcoa supplied alloy 5050 in 0.081-in. sheet for both orders.

The GTW box-car roofs comprised the largest number of this type ever produced in the United States of aluminum. They were fabricated by the Pullman-Standard Car Manufacturing Company to fit PS-1 box cars. Each car roof was assembled from 12 aluminum stampings joined by 11 formed seam caps. End pieces are different from the ten center units to give an overlap at these points.

The complete aluminum roof assembly saves more than 1,250 lb when compared with ferrous roofing alloys and the roofing will never need painting, according to Alcoa. This company also points out that the first experimental aluminum box-car roof in the United States, applied in 1944, is in excellent condition today.

The 360 roof sections for the GN cabooses were fabricated by the Standard Railway Equipment Manufacturing Company, Hammond, Ind. These sections were installed at the road's St. Cloud car shops where the cars were built. For each car, aluminum rivets were used to assemble 12 sections at seam caps, while lock bolts secure the roof to side plates. Seam caps were fabricated similarly from alloy 5052.

The Great Northern expects a much lower maintenance cost from the unpainted roofs because of aluminum's resistance to corrosion. The reflectivity of the unpainted roofs is expected to make the cars cooler under a hot summer sun. One aluminum box car owned by the railroad has been in service 12 years and has traveled two million miles.



Workers applying aluminum roof sheets to PS-1 box car.

The caboose underframe is welded construction, designed for Waugh Equipment Company's cushion underframe. The Z-26 center sill weighs 41.2 lb per ft and is continuously welded. Draft gear is Waughmat cushion type WM-CG-4. The sides and ends of car are 0.10 in. welded steel plate. Interior lining is ½-in. plywood. Fiberglass insulation, 1-lb density, is applied 3 in. thick in roof, sides and ends, 4 in. thick in floor.

Fifteen cabooses are equipped with General Steel Castings four-wheel caboose trucks, the balance with Standard Car Truck Barber-Bettendorf swing motion caboose trucks. The journals are 5 x 9, with 33-in. IWW wheels. Each car is equipped with Jeffers lubricators on seven journals, a Miller lubricator on one journal. Side bearings are Waughmat WMB-8. Brake beams are of two types: the AAR No. 18 non-unit cast and ASF unit cast. Type E couplers are used with Standard Railway Equipment release rigging.

### "Radiation Area—Caution"

This sign appears on the side of Southern Pacific locomotive No. 5658. It is not an atomic locomotive, but it does contain radioactive isotopes and is at work for science on an out-of-the-way stretch of track in the SP's Bayshore shops at San Francisco.

Research engineers from the SP and the Standard Oil Company of California, who are cooperating in the project, say No. 5658 gives them as much wear data in six to eight hours as an ordinary locomotive could provide in six months to two years, with results showing a "surprisingly close correlation" with findings from the more time-consuming field tests.

Four of the 16 pistons in No. 5658 bear a ring which has been converted to a gamma ray-emitting isotope of iron. The rings are products of two weeks' irradiation in an atomic pile at the Argonne Laboratories near Chicago.

By controlling such variables as the type of lubricating or fuel oil, the temperature of the cooling water, the speed of the engines, the horsepower output, and the kind of air filtration, the many factors which influence engine wear can readily be evaluated.

In the running engine, the stream of lubricating oil carries away minute particles of wear metal from the rings and forces samples of the radioactive debris through a counting well. A bundle of Geiger tubes in the well continuously monitors the gamma-ray bombardment. A scaler counts the hits and an electric clock records them. Later, an electronic computer working on the clock's information tape comes up with a plot of the wear rate.

### Proper Maintenance of Freight Car Brake Hanger Details

In a recent circular to member roads, the AAR calls attention to a considerable degree of laxness in applying brake hanger details

(*Continued on page 14*)

# For safer, easier equipment cleaning...

# DRY

## ACID CLEANERS

### based on Du Pont sulfamic acid

• Cleaning compounds based on Du Pont sulfamic acid are handled *dry*, until they are dissolved for use.

New cleaning compounds made with sulfamic acid are sold and handled *dry*—no hazardous liquids to ship or store. Dry, or dissolved in water for use, they create no fumes. Yet these cleaners have all the penetrating power of hydrochloric acid with far less corrosive effect.

Sulfamic acid-based cleaners remove scale and deposits from air-conditioning and ice-making equipment, food-processing vessels, steam boilers, milk evaporators and pasteurizers, marine evaporators and heat exchangers. Cleaning action is fast, thorough.

We'll gladly send you more information on sulfamic acid-based cleaners and the names of formulators who offer these new compounds. Just mail the coupon below.

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept., N2533, Wilmington 98, Del.

Please send me: ☐ sulfamic acid general equipment-cleaning bulletin; ☐ names of formulators offering cleaners based on sulfamic acid.

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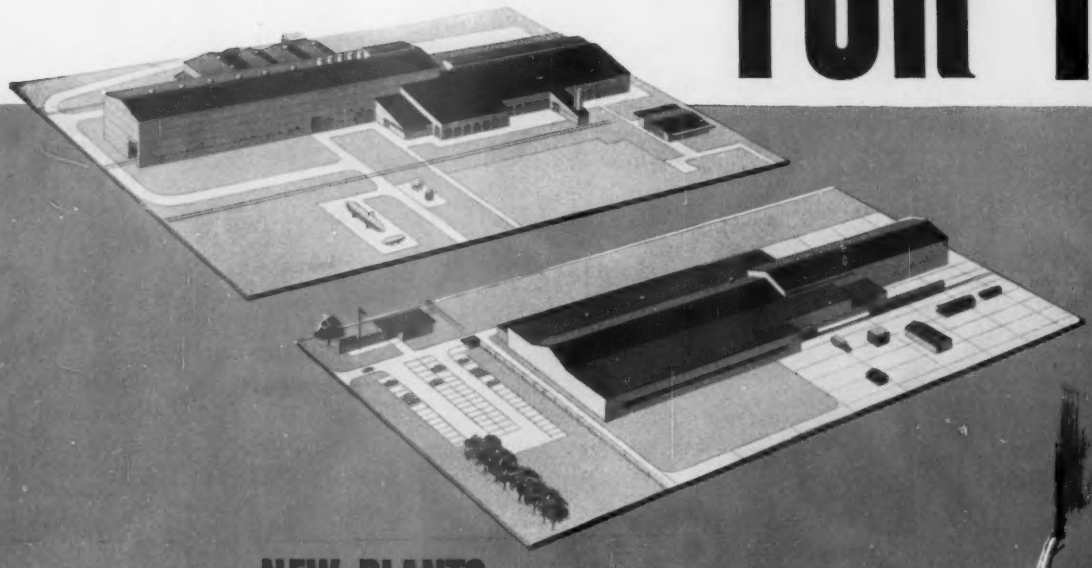
DU PONT
REG. U. S. PAT. OFF.

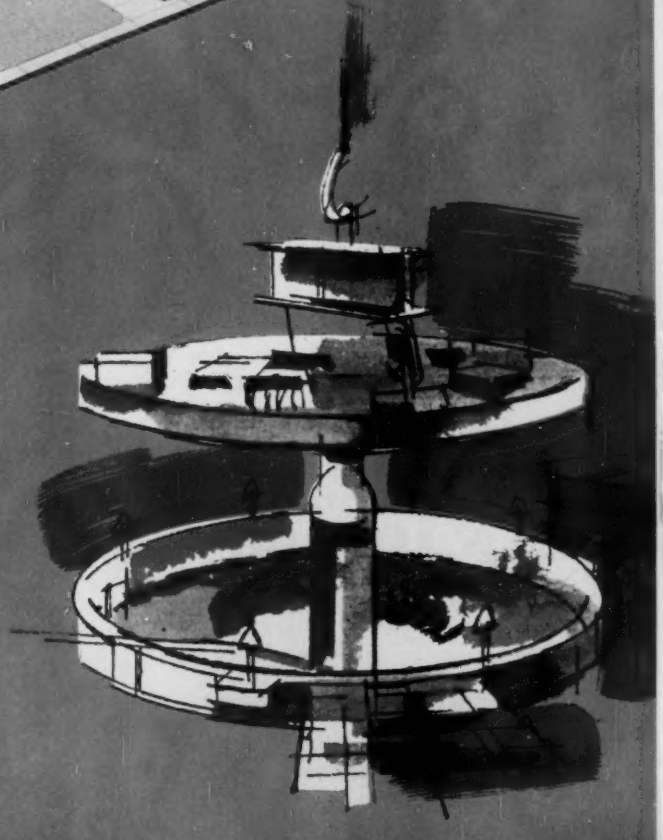
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

# LOOK TO GRIFFIN FOR THE



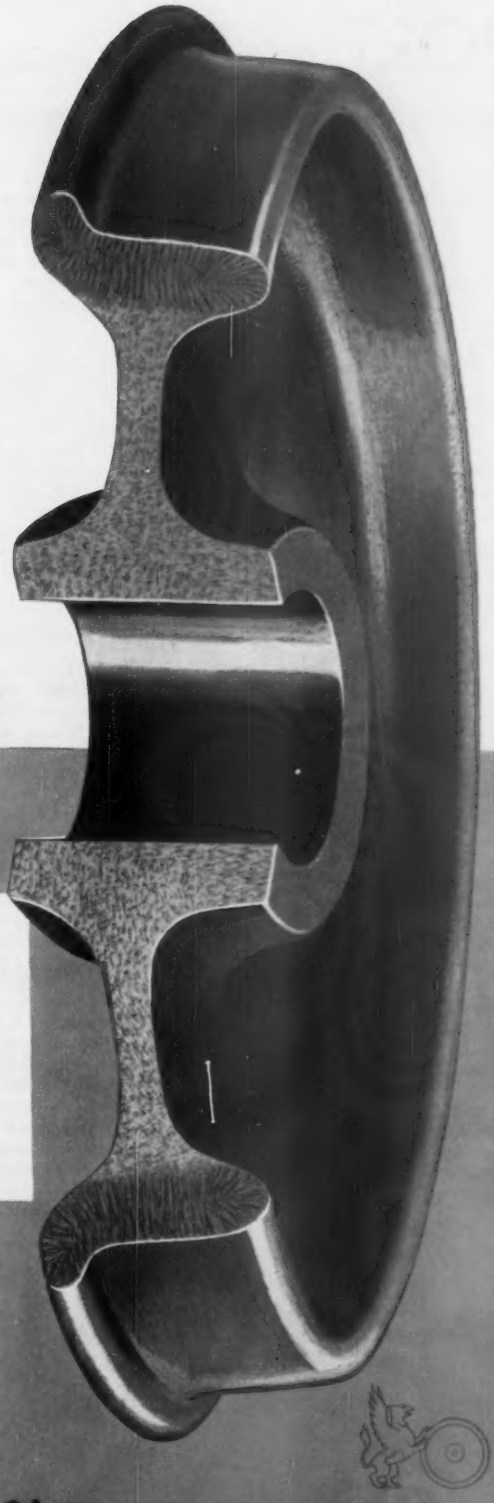
## NEW PLANTS

With the Griffin EQS already AAR approved, the new Colton, Cal. plant is already in production, and new plants are now being built at Kansas City, Kansas and Transcona, Manitoba. In short, acceptance of the EQS is so complete that Griffin is still the world's largest producer of freight car wheels . . . still strategically located to provide you with the best of service!



*Give the "green" to* **GRIFFIN**
*and watch your costs go down!*

# "NEWS"...



## NEW DESIGN

The Griffin EQS has long, sweeping fillets under flange and rim to insure greatest possible strength. And note that the grain structure of the tread and flange is also a new "design"—at right angles to the point of wear. Result: longer life.

## NEW MANUFACTURING PROCESS

Pressure pouring in graphite molds—a new concept in wheel casting—was developed by Griffin to provide a truly precision wheel. The Griffin EQS is perfectly round as-cast. Requires no machining. With fewer tape sizes, railroads can reduce wheel inventories.

**GRIFFIN EQS®**
ELECTRIC QUALITY STEEL

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445 N. Sacramento Blvd., Chicago 12, Illinois
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MEMBER OF RAILWAY WHEEL ASSOCIATION

# REPORT FOR MAY—*Continued from page 10*

of various kinds. One member road recently reported two serious derailments caused by brake beam dropping because of missing brake hanger retainers. These derailments resulted in damage of $375,000. Additional cases were experienced where brake beams came down while being handled in trains due to improper maintenance of brake beam retaining features on the cars.

A rigid inspection by the same road at its terminals revealed many defective conditions in brake hanger parts. Photographs were taken and were attached to the circular. The AAR also was furnished a 42-page report on conditions found on a large number of freight cars in general. The report includes a large number of cases where the U-type hanger retainers had not been sufficiently spread. This could cause them to become badly worn or even missing where a bad riding truck with unfavorable wheel conditions was involved.

The AAR suggests the matter of proper maintenance be called to the attention of all concerned.

## ICC Issues New Locomotive Rules

New rules and instructions for inspection and testing of locomotives other than steam will be effective January 1, 1959. The new rules were released on April 1, after hearings by the Interstate Commerce Commission. The Association of American Railroads, the American Short Line Railroad Association, individual railroads, and brotherhood representatives all presented evidence during sessions which have been conducted at various times since the original rule proposals were issued early in 1955.

The commission did not act on Rule 203 changing daily inspection practices, which is the subject of a separate case. While the new rules are effective next January, certain equipment changes are required prior to that time.

By December 31, 1958, a brakepipe valve will have had to be installed at the fireman's position in all locomotive units, and air-brake systems will have had to be equipped with a device to restrict passage of oil from the compressor. Shatterproof glass is mandatory in all cab windows by the end of this year.

Other changes exciting discussion at the ICC hearings included the installation of safety hangers under spring planks, spring seats or bolsters of trucks; a ban on the welding of wheels except for the repairing of flat spots and worn flanges on switchers; the provision of a safe passageway between locomotive units with open-end platforms; and a requirement that fuel-tank cut-off valves can be reset without hazard to operating personnel.

## Orders and Inquiries For New Equipment

Orders for only 70 freight cars have been placed since the closing of the April issue. The *Florida East Coast* has ordered five 50-ton bulkhead flat cars from the Thrall Car Manufacturing Company at an approximate cost of $32,500, for delivery July 1. The *Norfolk & Western* ordered 25 50-ton box cars from Pullman-Standard, for delivery in April. The *Northern Pacific* ordered 25 40-ft mechanical refrigerator cars from Pacific Car & Foundry at an approximate cost of $500,000 for August delivery. The *Arthur Equipment Company* has ordered 15 70-ton covered hopper cars from Thrall for July and August delivery.

The *Milwaukee* is inquiring for 1,000 50-ton steel box cars, each with a 7-ft plug door and an 8-ft standard door; 100 50-ton Airslide covered hopper cars, and 50 70-ton covered hopper cars. The *North American Car Corporation* will convert 50 refrigerator cars to insulated box cars. Changes will include the installation of 6-ft sliding doors to replace 4-ft swing doors, installation of steel roof and ends, and Masonite floors.

## Miscellaneous Publications

TEST CODE FOR DIESEL AND BURNER FUELS. 84-page "Test Code for Diesel and Burner Fuels" contains methods for the collection of samples and the determination of all physical and chemical properties for the value of liquid fuels when they are used to generate heat or power. Gasoline or other fuels used in spark ignition engines are not included, however. A brief introduction discusses the significance of each test method.

American Society of Mechanical Engineers, 29 West 39th st., New York 18. Price, $4.

# Personal Mention

**Atlantic Coast Line.**—*Sandford, Fla.:* F. P. DUNN appointed general foreman. Formerly general foreman at Tampa, Fla.

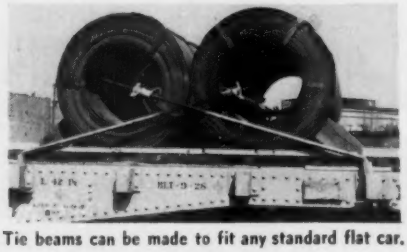
**Baltimore & Ohio.**—*Mt. Clare, Baltimore:* F. R. GEISELMAN, assistant mechanical engineer, appointed mechanical engineer, succeeding *A. B. Lawson,* retired.

**Canadian National.**—*Montreal:* J. J. HARRIS, mechanical engineer, shop methods department, appointed mechanical engineer (car), system. R. S. WADDINGTON, mechanical engineer, shop methods department, appointed mechanical engineer, motive power and car equipment department. *Winnipeg:* W. J. HART, appointed assistant general superintendent of car equipment, Western Region. Formerly mechanical engineer (car) at Montreal.

**Canadian Pacific.**—*Montreal:* D. F. HANEY appointed engineer of electrical equipment and power plants, succeeding *A. E. McGruer,* deceased. GEOFFREY W. STEVENS appointed en-

(*Continued on page 56B*)

Frisco standard flat takes 60 ton of coil steel. Center compartment stores tie-down equipment.



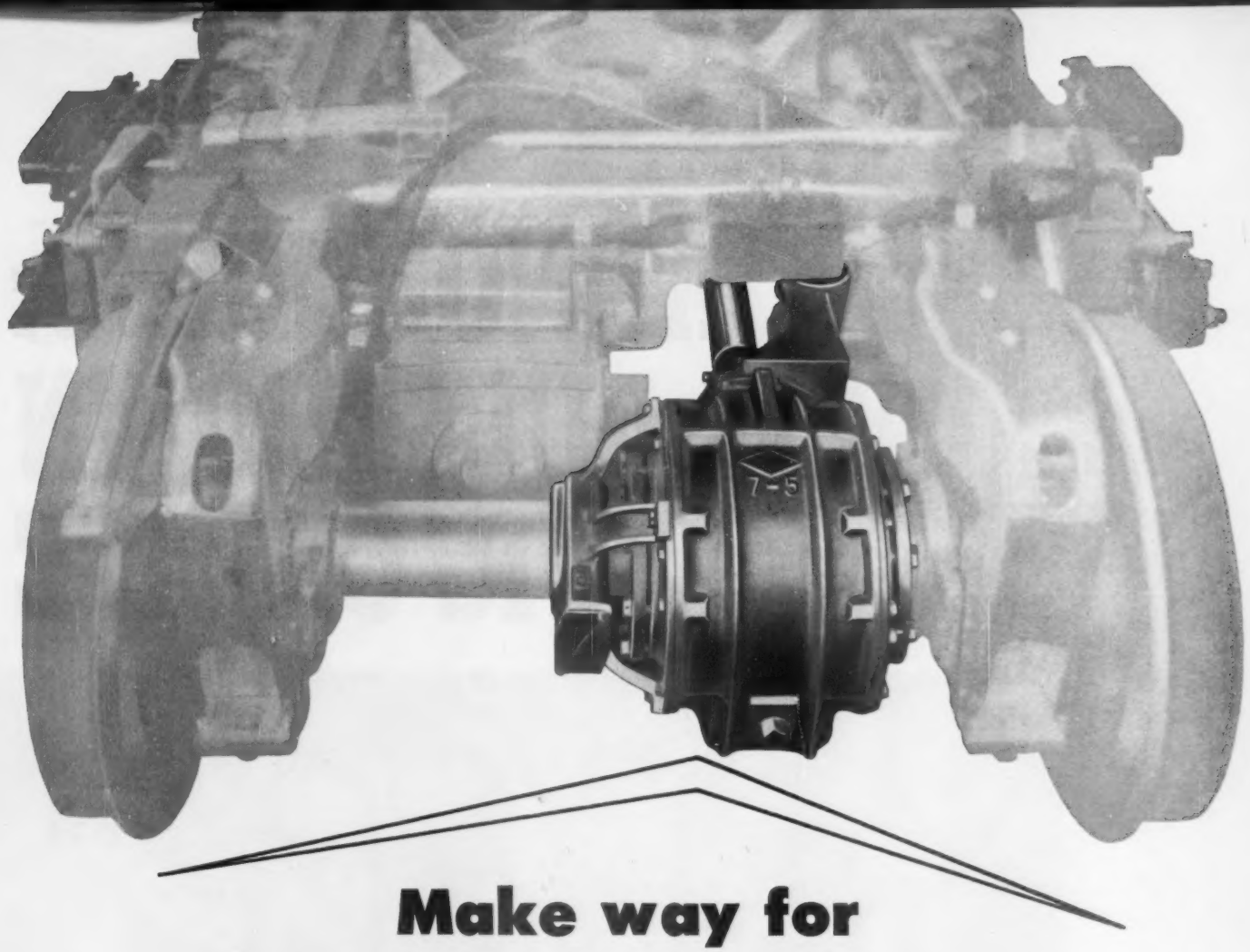
Tie beams can be made to fit any standard flat car.

## How the Frisco Handles Coil Steel

A standard flat car, with bracing and blocking developed by the Frisco's mechanical and transportation departments, is now in service hauling coil steel shipments from the Granite City Steel Company, Granite, Ill.

The tie beams fit into regular stake pockets of the car, eliminating the necessity of having a captive or special car. Lateral braces through the coils fitted over threaded portion of beams have large tightening lugs to rapidly and easily tie the load down. These anchors, plus wood blocking at ends forming a cradle effect, permit little or no shifting during shipment. Eight coils, each weighing 15,000 lb, can be shipped on a single car. An overhead crane can load the car in 28 min. Either a fork lift or the crane can be used in unloading.

The tie beams used in holding the steel en route are returned in a center storage compartment. Cost of equipping a car is said to be about $200.



# Make way for Lightweight Design with Spicer Traction Motor Drives

Spicer Traction Motor Drives play an important part in reducing the cost and weight of the newest self-propelled Rapid Transit cars being produced by the Pullman-Standard Company. 50 of the new cars are already in service for the Metropolitan Transit Authority of Boston, Massachusetts.

These cars employ high-speed, lightweight motors which are coupled by Spicer high-speed propeller shafts to Spicer Traction Drives. The drive permits the application of inboard bearing trucks which provides weight and cost saving features.

The Spicer Traction Drive permits maximum acceleration through a single set of gears with optional ratios to match train schedules ranging from 5.88 to 1 up to 8.9 to 1.

To insure maximum performance, the Spicer assembly is delivered complete — ready to be secured on the axle. No further adjustments are necessary, for each set of gears has been mated, factory-adjusted and tested under actual running conditions.

If you're interested in cost and weight savings, as well as maximum efficiency from railway traction drives, write for the latest Spicer Technical Bulletin. The address is Dana Corporation, Toledo 1, Ohio.

## DANA CORPORATION • Toledo 1, Ohio

***DANA PRODUCTS Serve Many Fields:***

**AUTOMOTIVE:** Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

**INDUSTRIAL VEHICLES AND EQUIPMENT:** Transmissions, Universal Joints, Propeller Shafts, Axles, Gear Boxes, Clutches, Forgings, Stampings.

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**RAILROAD:** Transmissions, Universal Joints, Propeller Shafts, Generator Drives, Rail Car Drives, Pressed Steel Parts, Traction Motor Drives, Forgings, Stampings.

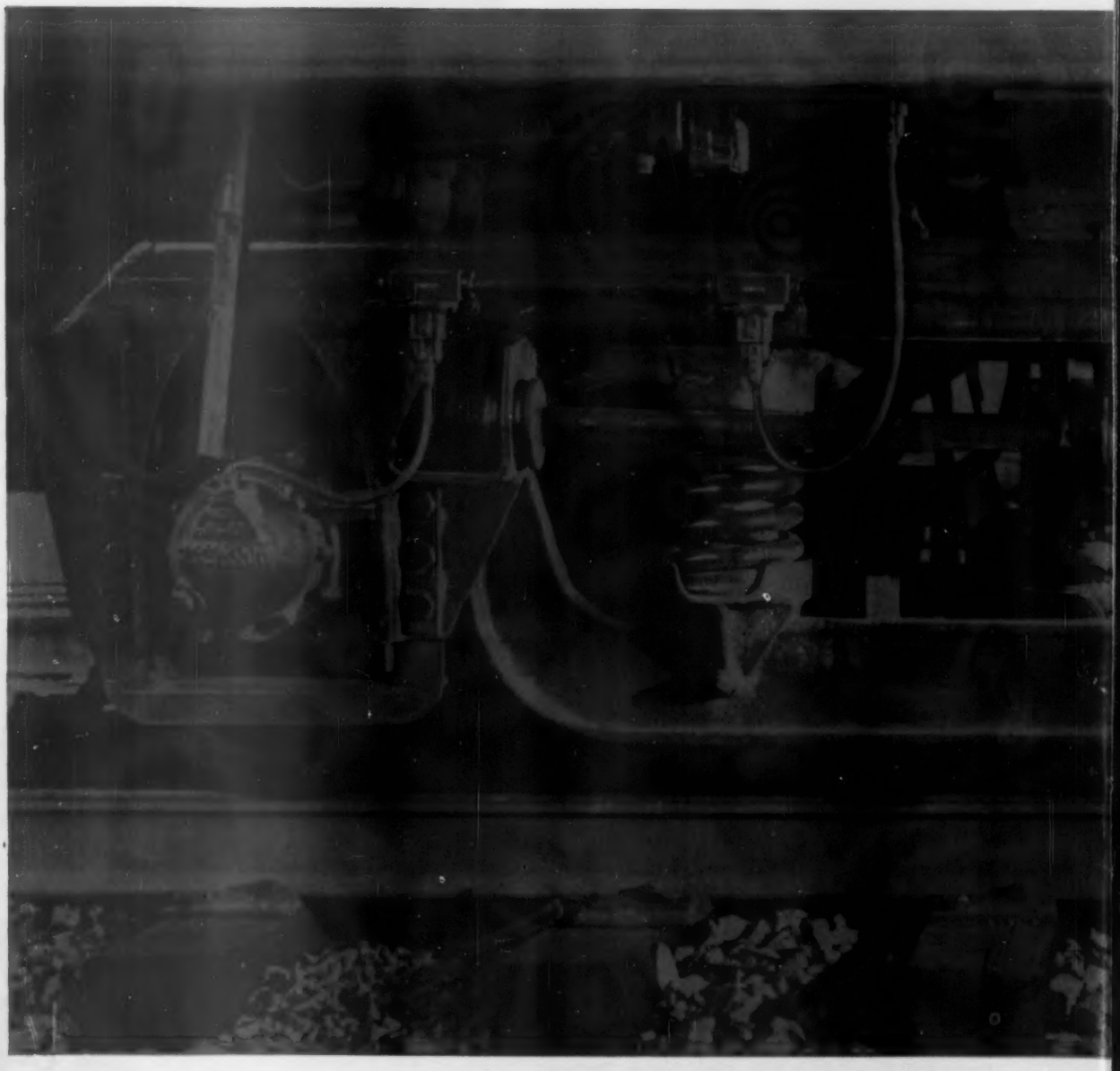
**AGRICULTURE:** Universal Joints, Propeller Shafts, Axles, Power Take-Offs, Power Take-Off Joints, Clutches, Forgings, Stampings.

**MARINE:** Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

*Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario*

DANA Spicer

# ANNOUNCING: NEW GULFCROWN R.R. GREASE



New Gulfcrown R. R. is a lithium base grease especially developed to provide better lubrication for railroad car roller bearing journals. It has been tested and approved against new A. A. R. Specification No. M-917-56—your assurance that Gulfcrown R. R. grease will stand up under the toughest railroad conditions.

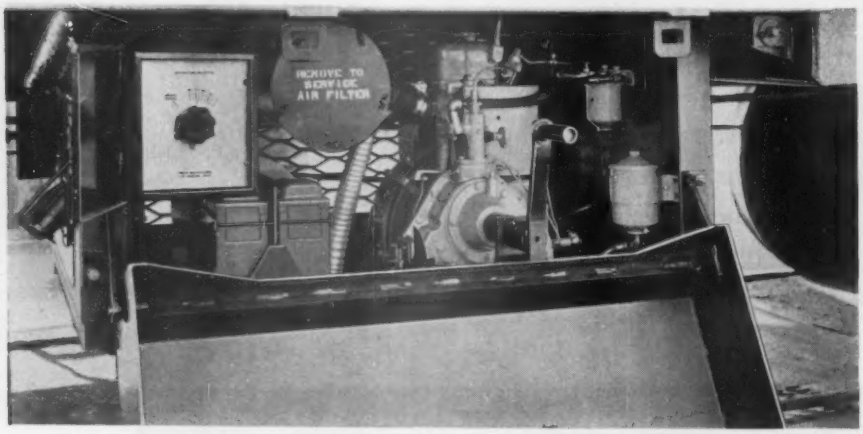
Let us have the opportunity to prove that you will get more effective roller bearing protection—and reduced maintenance costs—with this outstanding new grease. Gulfcrown R. R. is available now. For further information, write, wire or phone your nearest Gulf office.

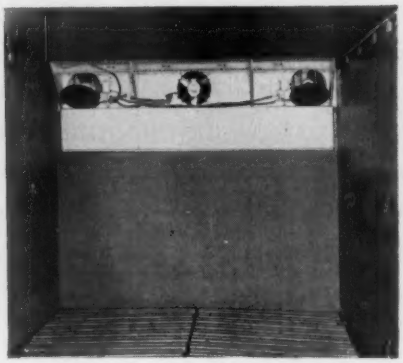
GULF

**GULF OIL CORPORATION**

Dept. DM, Gulf Building · Pittsburgh 30, Pa.

# LOCOMOTIVES AND CARS WHAT'S NEW IN EQUIPMENT



## Automatic Temperature Control for Ice Reefers

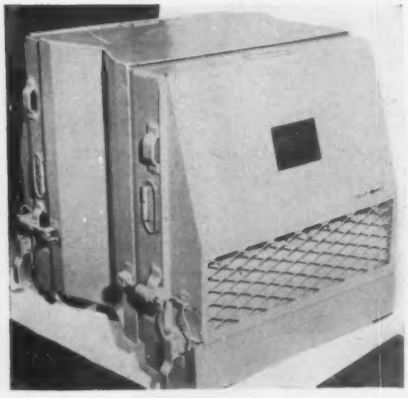
The first two ice-cooled refrigerator cars (PFE 8132 and SFRD 3494) equipped with Preco "Cargotemp" continuous-running air-circulating fans and thermostat control for any pre-set temperature between 30 and 70 deg F are in service.

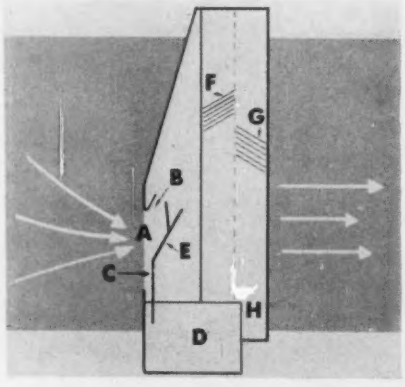
This forced-air circulating system is designed for application in any standard RS type ice-bunker car, either 40 or 50 ft. Cooling equipment consists of four electrically driven bunker fans—two in each end, thermostatically controlled and arranged to force air through the load and through the ice bunker when refrigeration is required. Dampers, controlled by the same thermostat, stop convection circulation when the thermostat setting is reached.

Two additional fans—one in each bulkhead—bypass the ice bunkers and force air through bulkhead channels to maintain uniform cargo temperature when the four ice bunker fans are in off position. These two bypass fans operate continuously at all times and have no damper control.

Electric power for the fans is supplied by a 3-hp single-cylinder air-cooled diesel engine with gravity fuel flow which drives a 220-volt, 3-phase, blower-cooled alternator. A 60-gal steel fuel tank, with convenient filler neck, dip stick, and sump, are provided.

Advantages claimed for "Cargotemp" by the manufacturer include: (1) continuous forced air circulation from loading to unloading for 16 to 18 days, with air delivery equivalent to the output of wheel-driven electric fans at a sustained speed of 70 mph; (2) thermostat control for any present temperature between 30 and 70 deg; (3) fast precooling while standing or in transit to provide 100,000 Btu per hr initial heat removal from a warm load without salt; (4) full retention of all modified services—vent, stage icing, heaters, initial icing only, and one icing in transit; (5) full safety in case of any failure when convection circulation through ice takes over; (6) standby electric plug-in service for destination or terminal delay holding. *Preco, Inc., Dept. RLC, Los Angeles, Calif.*






## Oil-Bath Air Filter

The Farr-Air Oil-Bath air filter is designed for protection of all diesel engines where intake air filter requirements make an oil bath installation desirable. Illustration (left above) shows two rectangular filters applied in an existing vertical-panel filter-holding assembly without reworking.

Unfiltered air enters through the guard screen *A* (right above) and the major portion passes through the venturi-like passage *B*. The balance of the air passes down through the passage *C*, agitating the oil in the sump *D* and carrying the oil in droplet form up and into contact with the filter media *F*. The oil control baffle *E* permits oil in droplet form to wash to the top of the media throughout the entire range of air demand. Eliminator media *G* provides for return of oil and contaminants to the return sump *H* where the dirt settles out and the oil returns to *D* for continuous recirculation.

The filter media is constantly scrubbed in a bath of oil which returns collected dirt to the sump. The only service required is periodical draining, removal of sludge, and refilling to the proper level with clean oil. This may be done without removing the filter and breaking the air seal.

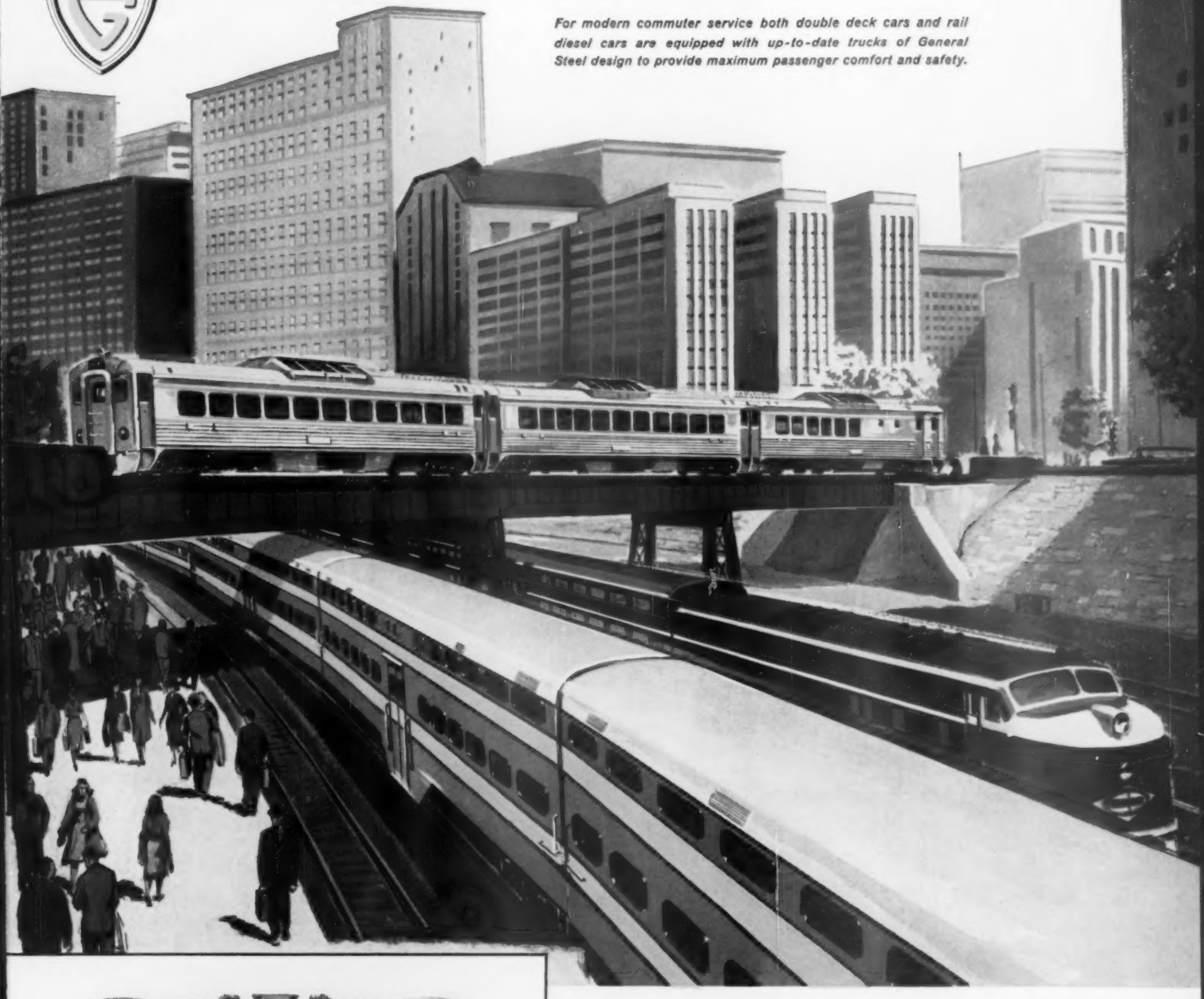
Pressure loss across this air filter is about 5 in. water gauge at rated capacity and throughout the normal operating range. Laboratory tests using standard fine dust are said to show equal or better efficiency than the original Farr 4-in. panel filter or the self-cleaning Rotonamic air filter now in general use.

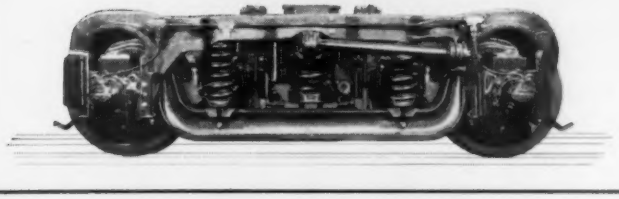
The manufacturer has recently developed Rotonamic air cleaner kits which include filters and all associated parts required for application to each type and size of locomotive made by the various builders. Instructions for ordering and installation apply equally well with the new oil-bath air filter when special dust conditions on individual roads seem to make this type of filter preferable. *Farr Company, Dept. RLC, 2301 Rosecrans st., El Segundo, Calif.*

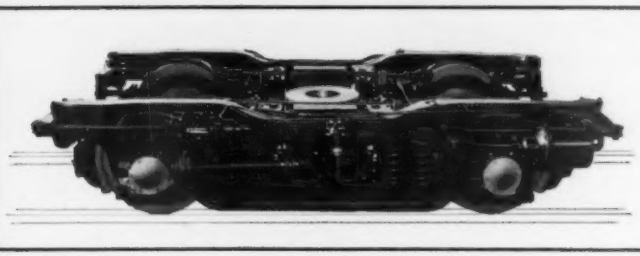
(*Turn to page 60*)

# Where railroad progress is cast in steel....

*For modern commuter service both double deck cars and rail diesel cars are equipped with up-to-date trucks of General Steel design to provide maximum passenger comfort and safety.*







A combination of imaginative engineering and down-to-earth manufacturing know-how has enabled General Steel to make vital contributions to the growth and development of industry throughout the world. Their one-piece steel castings are the culmination of design and production skills unique with the company.

Specify General Steel products . . . they will pay you dividends through many years of maintenance-free service.

*Latest design 4-wheel equalized truck for direct drive rail diesel cars assures exceptional riding comfort and safety . . . minimum upkeep cost.*

*Modern 4-wheel equalized truck for double deck commuter cars. Large Central Bearing eliminates lateral shimmy and side bearing upkeep . . . increases mileage between wheel turnings and reduces operating costs.*

## GENERAL STEEL CASTINGS

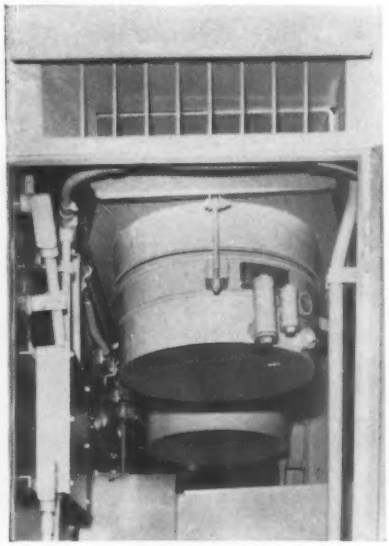
GEARED TO PROGRESS

P R I MEMBER

GRANITE CITY, ILL. • EDDYSTONE, PA. • AVONMORE, PA.

*On these diesel-electric locomotives...*

# Intake air is thoroughly cleaned with AIR-MAZE oil bath filters



*On these General Electric locomotives, Air-Maze oil bath filters provide clean intake air to the Cooper-Bessemer diesels.*

For over four years, General Electric locomotives for export service have relied on Air-Maze oil bath filters for cleaning the intake air to their efficient Cooper-Bessemer diesels. And for good reason:

Air-Maze oil bath filters maintain at least 92% efficiency* . . . even at lowest locomotive speeds. That's because their inherently high efficiency does not depend on high air velocity as do other filtering devices.

For most locomotive service requirements, maintenance is confined to simply checking oil level every month, filter oil changes at three month intervals, and cleaning a bowl once a year.

Reports from leading railroads in this country show that Air-Maze oil bath filters double . . often triple . . . power assembly life. Savings in engine and filter maintenance often pay for the cost of the filter in less than a year.

These important advantages can be applied to all locomotive diesels today. For complete data, call us or contact your locomotive builder. The Air-Maze Corporation, Cleveland 28, Ohio. Dept. RL-5

*With Standard Air Cleaner Fine test dust, 39% of which is less than 5 microns.

***The biggest names in diesels are protected by Air-Maze filters.***

**AIR-MAZE**

***The Filter Engineers***

ENGINE AIR FILTERS • CAR BODY FILTERS • LUBE OIL FILTERS • PASSENGER CAR FILTERS

# USG® BRUSHES AY32 AND 2306 ARE THREE WAYS *BETTER*

## LOW COMMUTATOR MAINTENANCE

Because of their long life and reduction of copper drag which minimizes flashovers, USG Brushes AY 32 and 2306 have proven convincingly that they reduce the maintenance cost on Diesel-Electric locomotive generators.

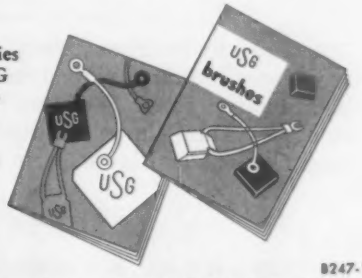
## LONGER LIFE—MINIMUM WEAR

Primarily because of their purity and density, USG Brushes operate perfectly for substantially longer periods of time than the average type brush. Naturally, this means reduction in delays due to brush replacement.

## PERMANENT SHUNT CONNECTION!

In recent years nearly every reputable brush manufacturer has improved the anchorage of the shunt connections: none, however, are quite as firm or quite as permanent as the method employed on USG Brushes, called STATITE®. The shunt can't be jerked out and, of course, it does not jar loose.

Write for your copies of the latest USG Brush Catalog B-56 and the new USG Brush Grade Supplement.

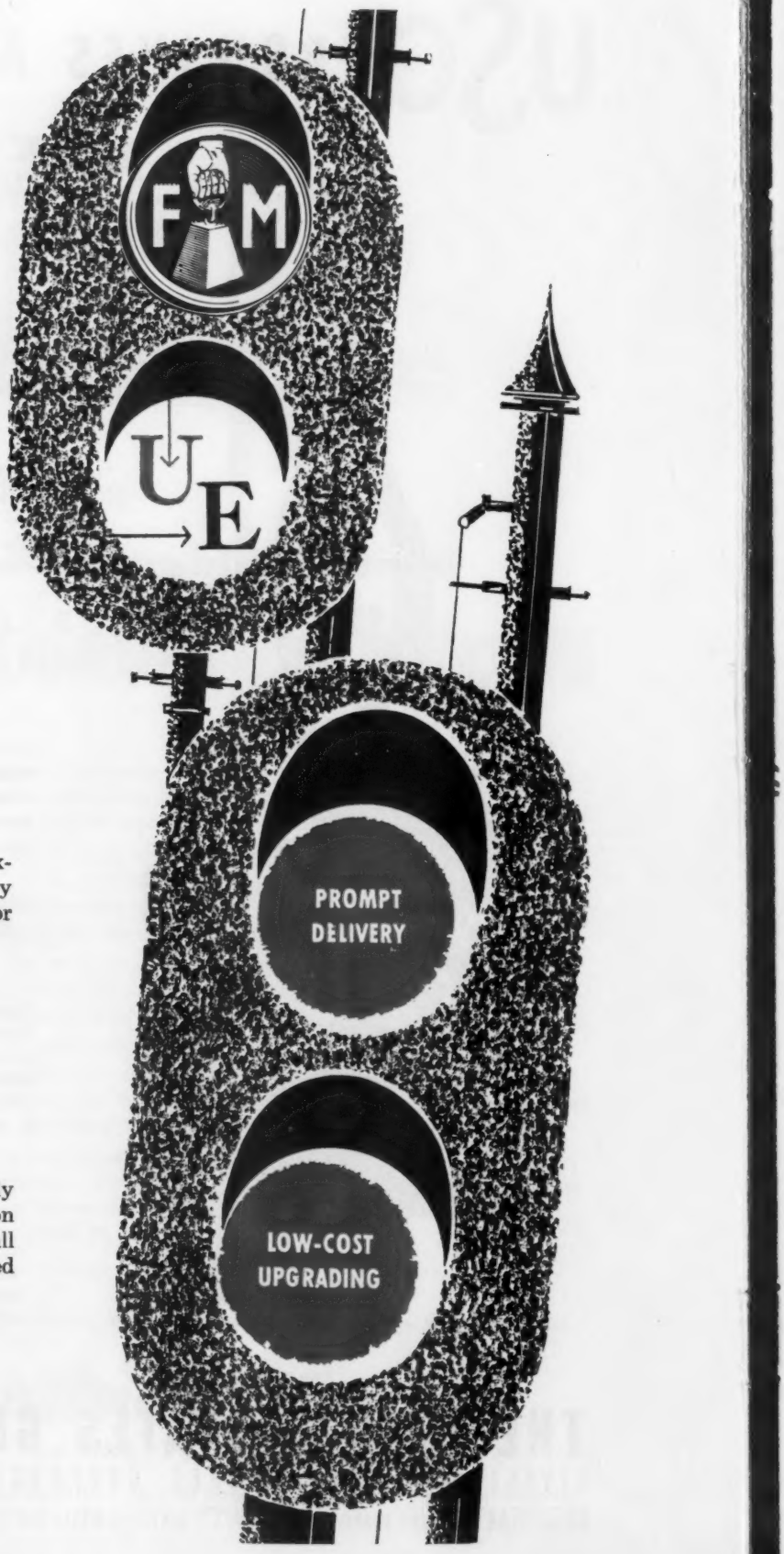



B247-1

**THE UNITED STATES GRAPHITE COMPANY**

DIVISION OF THE WICKES CORPORATION, SAGINAW 13, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® SINTERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

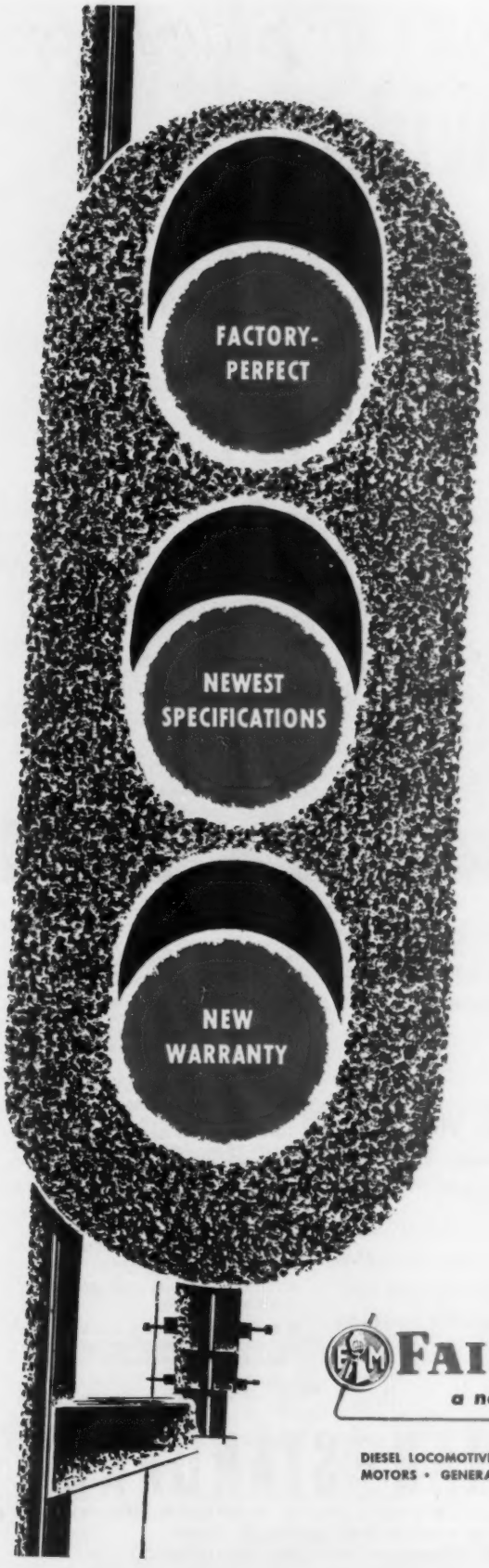



**UNIT EXCHANGE**

The only engine better than the O-P you have is an Opposed-Piston diesel made better by Fairbanks-Morse — available NOW through F-M Unit Exchange.

Due to a 60% increase in the F-M Unit Exchange program, there are O-P engines of every rating and major accessory group ready for prompt shipment on your order.

This F-M program enables you to effectively meet increased tonnage demands being made on your motive power fleet, yet reduces costs all along the line—lower maintenance, reduced shop facilities and lower parts inventory.




The only engine better than the O-P you now have is one "made better" by F-M craftsmen, who have the skill and techniques acquired through daily experience with only *one* engine design.

F-M's continual search for better engine performance and life can substantially improve the O-P engine and its components of five to ten years ago in many respects. Unit Exchange equipment meets the newest specifications.

Each engine, blower, pump, injection system, generator and traction motor in the F-M Unit Exchange program is warranted to give the same performance as new equipment.

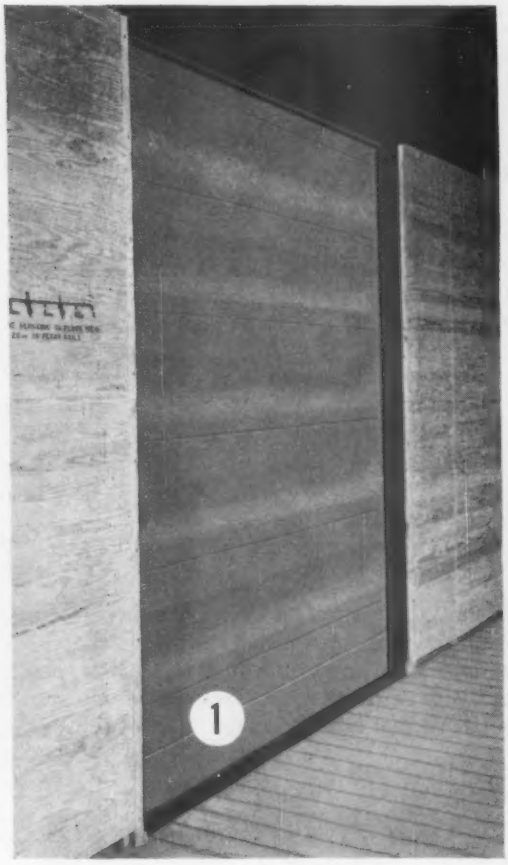
**For full details and delivery schedules, write: Diesel Locomotive Service Department, Fairbanks, Morse & Co., Chicago 5, Illinois.**

**FAIRBANKS-MORSE**

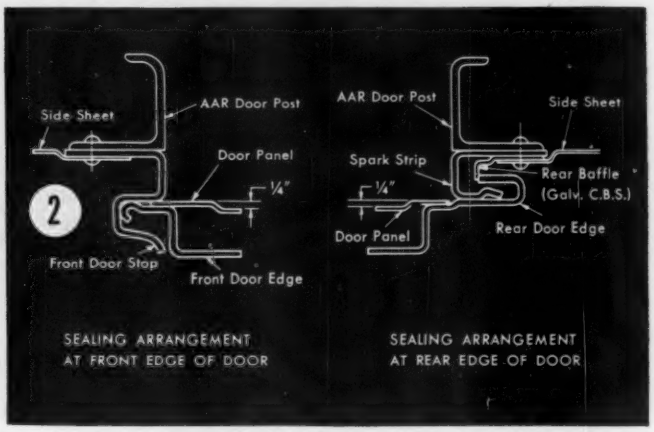
***a name worth remembering when you want the BEST***

DIESEL LOCOMOTIVES AND ENGINES • MOTOR CARS AND RAILROAD EQUIPMENT • ELECTRIC MOTORS • GENERATORS • PUMPS • SCALES • WATER SERVICE EQUIPMENT • HAND LAMPS

# *Pullman-Standard Box Car Side Doors*




# provide positive lading protection




**1 SMOOTH INTERIOR PREVENTS DOOR DAMAGE TO LADING!** Pullman-Standard design allows the door interior to be finished with a smooth, even surface. All framing members are on the exterior. Door fixtures are arc-welded to the outside surface. No bulges, ridges or sharp edges to cause lading damage.

**2 SURFACE SEAL EDGES KEEP WEATHER AND DIRT OUT!** The Pullman-Standard box car side door design insures a positive seal through a special baffle arrangement that brings about surface contact on all four edges of the door. Water, light and flour tests plus years of rugged on-the-road service have proved that this sealing mechanism positively shields lading from weather and dirt. Watershed top retainer and trough type door header provide additional weather protection.

- **Sizes: 9' 11" or specified height. 6', 7', 8', 9', 15' or specified width.**
- **Heavy-duty combination lower panel and framing member of 5/32" corrosion-resistant, copper-bearing steel to withstand loading dock abuse.**
- **Other panels of .10-inch corrosion-resistant copper-bearing steel. Fixtures of forged or cast steel to withstand service abuse. All parts can be repaired by welding if accident-damaged.**
- **5" rollers with durable cage type roller bearings insure trouble-free, easy operation.**
- **All welded, precision fabricated, embossed for strength.**
- **Corrosion pockets eliminated by welded assembly.**
- **Self-protecting design and fabrication excellence provide for long life, easy maintenance.**

*For complete details and specifications on the P-S Box Car Side Door contact your nearest Pullman-Standard Sales Office or write to the address below.*

**PULLMAN-STANDARD**

**CAR MANUFACTURING COMPANY • SUBSIDIARY OF PULLMAN INCORPORATED**
**200 S. Michigan Ave., Chicago 4, Illinois**
BIRMINGHAM • PITTSBURGH • NEW YORK • SAN FRANCISCO

# The nylon collared Elastic Stop® nut never damages bolt threads!

## The nylon locking insert ⬭* will not seize threads, gall or remove plating

**Identification at a glance** is a major advantage offered by the red locking collar, an integral part of an Elastic Stop nut. Whether applied on the assembly line or reapplied by a maintenance crew, the red collar assures instant recognition as a lock nut.

Undersized in diameter in relation to standard bolt tolerances, this nylon locking insert grips the entering bolt threads with strong, smooth nylon fingers that dampen impact loads and resist turning under the most severe conditions of vibration or shock. The perfect fit between bolt threads and the locking collar also serves to seal off internal bolt and nut threads and to protect them against corrosion. Furthermore, the nylon insert is impervious to gasolines, oils, salt atmospheres, cleaning compounds and common acids. The remarkable wear resistance of nylon, plus its elastic recovery, makes Elastic Stop nuts reusable through more than a hundred on and off cycles.

Because an Elastic Stop nut is a one-piece unit, it is less expensive to install than castellated nuts and cotter pins, or double nuts. Equally important, it is a stop nut that locks at any position on the bolt without requiring secondary "safety" devices; it is simple to adjust precisely —it is easily wrenched off or readjusted.

Elastic Stop nuts are available in sizes ranging from a watchmaker's 0-80 through 3", and in many standard finishes and materials, including carbon and stainless steels, brass, duronze and aluminum.

**ELASTIC STOP NUT CORPORATION OF AMERICA**

ESNA®

*also maker of the* ROLLPIN™

*The Red Locking Collar is a Registered Trademark of ESNA

**Elastic Stop Nut Corporation of America**
**Dept. N50-528, 2330 Vauxhall Road, Union, N. J.**

Pease send me the following free fastening information:

☐ ESNA Bulletin on railroad applications ☐ ESNA Cataog No. 705, Standard Elastic Stop Nuts

Name_____ Title_____

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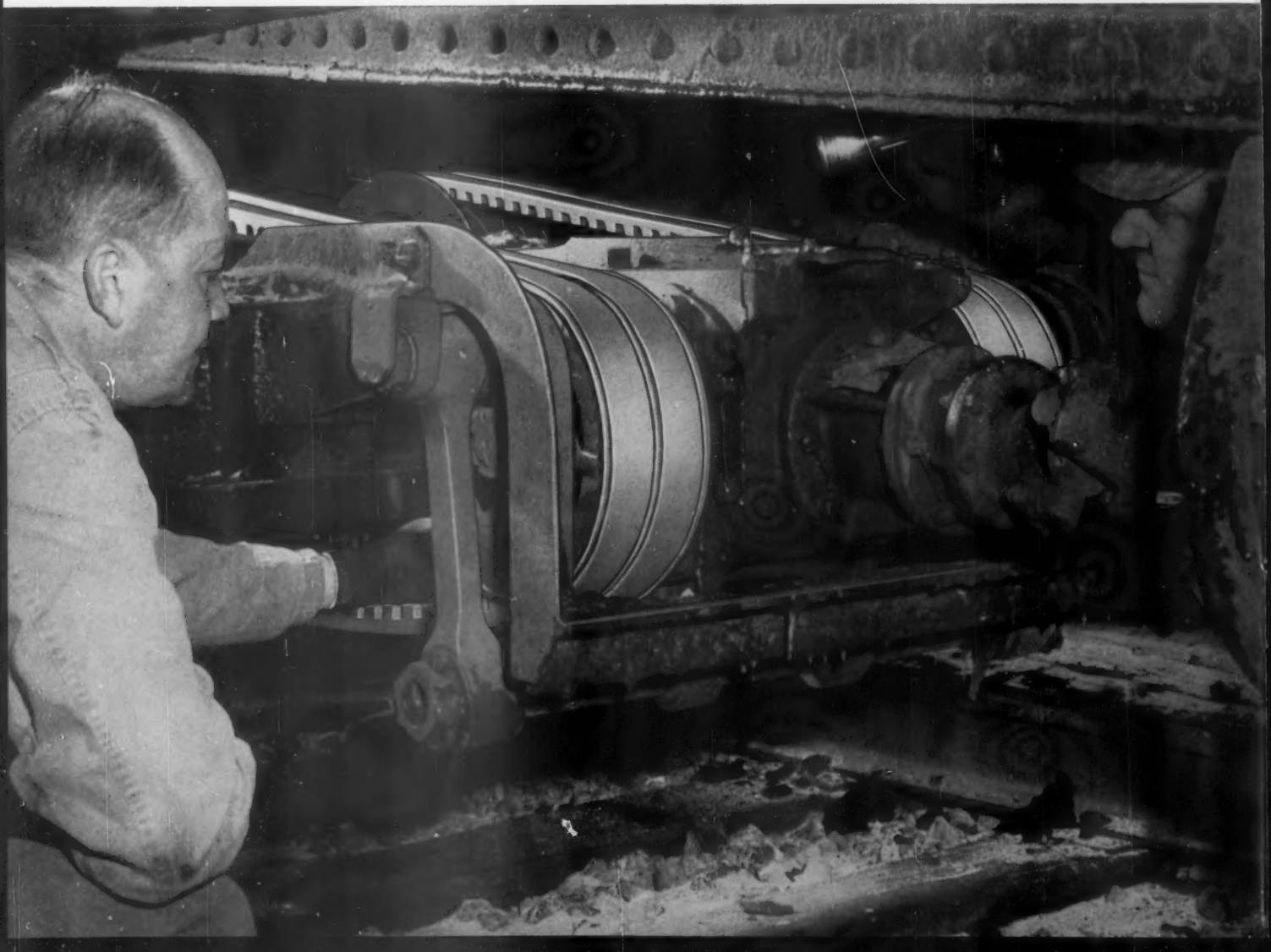
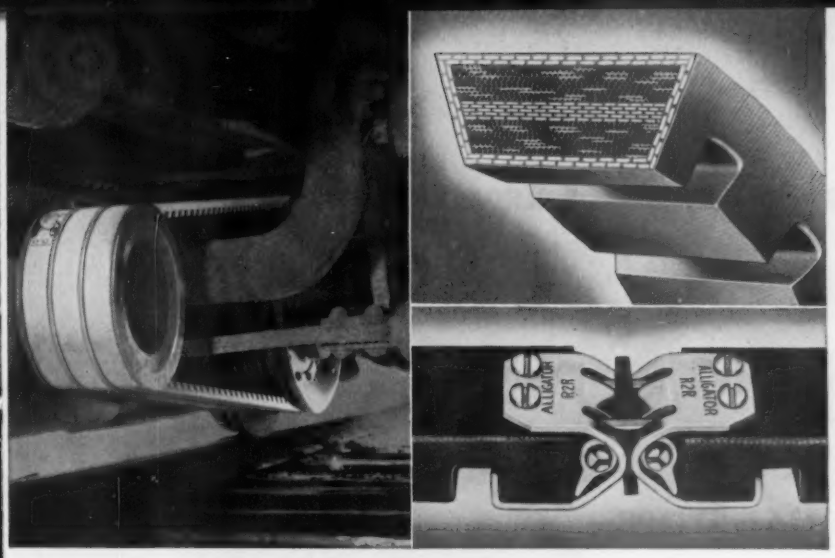
Street_____

City_____ Zone____ State_____

Dayton Railway 2" Cog-Belts are original equipment on Safety V-Belt Gear Box Drives manufactured by the Safety Car Heating and Lighting Company.

# Dayton 2" Cog-Belts* Deliver






This belt is especially designed for use with connectors — highly resistant to pullouts. For convenience and economy the Dayton 2″ Cog-Belt is available in 100 foot reels.

# Steady Power Despite Oil, Dirt, Heat, Moisture

## For Car Lighting, Heating and Air Conditioning Units, Dayton 2″ Cog-Belts deliver positive power under all road conditions.

Engineered and built specifically to meet the demanding requirements of railway under-car V-Drives, rugged Dayton 2″ Cog-Belts deliver power dependably and economically under the most adverse weather and road conditions.

Their high resistance to extremes of temperature, moisture, oil and dirt and their low-stretch factor reduces belt maintenance to a minimum, for exceptionally low-cost operation.

The best connections you can have between axle and driven unit are Dayton 2″ Cogs. They deliver positive power, yet cushion shock loads.

An experienced Dayton Railway Engineer will be happy to advise you on the application of Dayton 2″ Cog-Belts to your axle V-Drives or to help you solve any railway V-Drive problem. Just write Dayton Rubber Company, Railway Division, Dayton 1, Ohio.

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*TM

**Dayton Rubber**

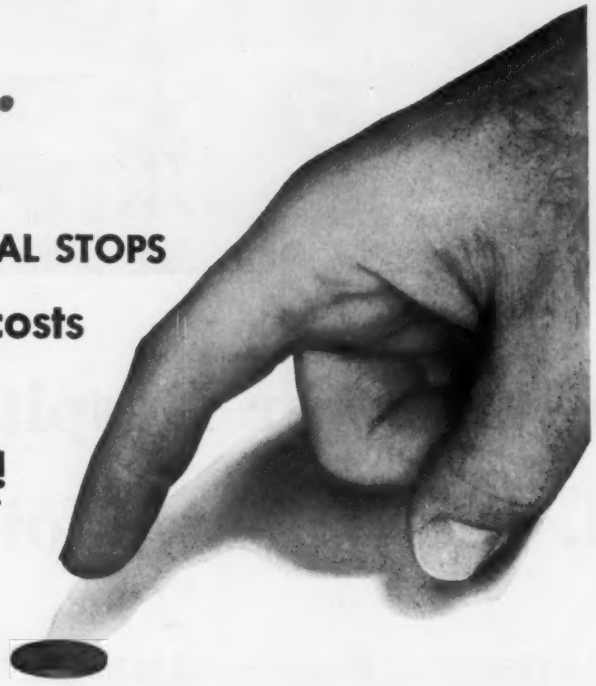
World's Largest Manufacturer of V-Belts

Specialized Railway Representatives in Atlanta, Chicago, Cleveland, Dallas, Dayton, E. Moline, New York, Rock Island, San Francisco and St. Louis.

**HOW SOLID BEARINGS AND JOURNAL STOPS HELP KEEP RAILROADS OUT OF THE RED**

# *It's a fact...*

## that MAGNUS R-S JOURNAL STOPS can cut total hot-box costs to less than 1 cent per car per day!



***Operating experience with more than 5,000 freight cars proves that Solid Bearings and Journal Stops are the low-cost solution to the hot-box problem***

Railroads using low-cost solid bearings and R-S Journal Stops today average over 6,000,000 car miles per hot box. Conservatively, new users of R-S Journal Stops can increase hot box mileage 10 times — can cut hot box costs to a tenth of current costs on similar cars in similar service. That means less than ⅓ cent per car per day to cover all costs associated with bearing road failures.*

That's just one of the facts about R-S Journal Stops, proved now on over 5000 cars in service. Essentially, they stabilize the bearing assembly, help provide uniform, uninterrupted oil film lubrication, give the solid bearing a chance to work at optimum efficiency.

Results: you double bearing life, reduce wheel flange wear, cut necessary service attention, prevent dust guard damage — in short, save on truck maintenance all along the line. This reduced maintenance alone will save you enough to pay for the Stops in 3 years.

And with R-S Journal Stops, you still have all the other advantages which low-cost solid bearings bring to railroad rolling stock. You can take the maximum load, make the fastest schedule. Lading gets the smoothest ride. You save excess dead weight and get lowest possible running resistance in pounds per ton. Best of all, you'll be sure of the kind of bearing performance you want at a price you can afford to pay. Write us for all the facts. Magnus Metal Corporation, 111 Broadway, New York 6, New York; or 80 E. Jackson Blvd., Chicago 4, Illinois.

*Cost based on data compiled by the Mechanical Division of the Association of American Railroads in 1955.

**MAGNUS**

# Solid Bearings

*Right for Railroads*
*...in performance...in cost*

**MAGNUS METAL CORPORATION** *Subsidiary of* **NATIONAL LEAD COMPANY**

# Dirt in Diesels Costs $138,733,385 Yearly

DIRT IN AND ON locomotives costs railroads $138,733,385 annually, according to J. W. Horine, electrical engineer of the Pennsylvania. This figure, an estimate, was given at the recent joint ASME—AIEE technical conference in Cleveland.

It is estimated that dirt is now responsible for approximately one-fourth of the total cost of maintaining and preparing diesel-electric locomotives for service. Slightly less than half of this can be rated as "avoidable". Mr. Horine goes on to point out that "whether or not the cost of avoiding this portion is warranted by savings would require detailed study of each individual case."

What dirt is, what bad effects it can produce, and what parts can be affected all enter into this. Dirt in diesel-electrics can be classified in three categories: Sand and roadside dirt (abrasive in nature); brake shoe dust (abrasive, conductive and magnetic); and trash (papers, leaves and rags).

Studies of costs at a well-equipped diesel shop showed that light (trip) cleaning costs $5.48 per unit and that the heavy cleaning in conjunction with monthly inspections costs $85.06 (of which $81.91 is labor). Applied on a national basis, a figure of $39,717,211 annually for cleaning was calculated.

The costs resulting from dirt entering diesel engines was evaluated on the basis of an extensive road test involving radioactive piston rings. It was found that either of two commercially-available filtering arrangements could produce a wear rate only 28.5 per cent as high as that produced by standard 2-in. impingement filters.

Over a period of almost four years, a study of material costs showed that the improved filtering could cut liner expenditures by 65.7 per cent, piston costs by 66.7 per cent, connecting rod bearing cost by 66.4 per cent, main bearing costs by 10.8 per cent, and piston ring wear by 71.5 per cent. The overall savings of 59.4 per cent resulted in a calculated saving of $865.25 per unit per year. This is further multiplied by an extension of the time between shoppings. The two figures are combined into an annual avoidable cost of $37,346,369.

### Electrical Equipment

Dirt damage to electrical apparatus cannot be evaluated or even estimated with reasonable accuracy, according to Mr. Horine. The varied causes of electrical failures, lack of accurate analyses of these failures, and the small amount of cost data on repairs to electrical apparatus are all factors. The combination of dirt and moisture, rather than the presence of either one alone, is a further complication.

Some dirt damage is avoidable. Added filtration of main generator and traction motor cooling air is possible, and dustproofing of the control and power cabinets could be improved. Future units could have sealed and pressurized engine rooms with filtering of all incoming air.

Repair costs for diesel-electric locomotives are divided approximately as follows: 35 per cent for diesel engine and appurtenances, 30 per cent for electrical apparatus, and 35 per cent for all other work. Mr. Horine then concluded

(*Continued on page 36*)

### What Dirt Does on Diesel Locomotives

| | |
|---|---|
| **Surface dirt:** | |
| Exterior of carbody | Poor appearance and surface damage |
| Trucks and running gear | Fire hazard and wear |
| Tops of fuel tanks | Fire hazard |
| Windows and windshields | Safety hazard and crew annoyance |
| Carbody interiors | Fire and safety hazard |
| **Internal dirt:** | |
| Traction motors | Flashovers, shorts and grounds |
| Main generators | Flashovers, shorts and grounds |
| Auxiliary rotating electrical apparatus | Flashovers, shorts and grounds |
| Control cabinets | Malfunctioning of controls and fire hazard |
| Diesel engines | Excessive wear rates |

### Annual Cost of Diesel Dirt on US Railroads

| | Unavoidable | Avoidable | Total |
|---|---|---|---|
| Cleaning | $39,717,211 | ——— | $39,717,211 |
| Diesel engines | ——— | $37,346,369 | 37,346,369 |
| Electrical apparatus | ——— | 23,564,938 | 23,564,938 |
| Other apparatus | 38,104,867 | ——— | 38,104,867 |
| | 77,822,078 | 60,911,307 | 138,733,385 |

### Dirt's Place in 1956 Overall Costs

| | US totals | Dirt damage Estimate | Per cent of total |
|---|---|---|---|
| Enginehouse expenses (ICC Acct 388 and 400) | $136,361,652 | $39,717,211 | 29.1 |
| Locomotive repairs (ICC Acct 311) | 435,484,197 | 99,016,174 | 22.7 |
| | 571,845,849 | 138,733,385 | 24.3 |

# How Much Air Filtering Can You Justify?

DIRT AND DEPOSITS in the engine and electric equipment of a diesel-electric locomotive are generally considered harmful. Filtration equipment is designed to remove as much of the dirt as possible within economic limits. However, there is a level of cleanliness beyond which it is not feasible to operate.

Electric rotating equipment requiring the most maintenance include the main generator, traction motors and the various auxiliary generators and motors. In spite of the fact that some units without filters, principally diesel switchers, operate in very dirty air on all railroads, we have few difficulties due to the abrasive effect of dirt. Inspection of motor and generator commutators on these locomotives will rarely, if ever, reveal any indication that these parts are worn because of dirt. This is no doubt due to the centrifuge effect of the rotating armature which, in part, is self-cleaning.

In this equipment there is another form of dirt which is more harmful. That is the self-generated variety. The dirt, or carbon dust, which forms from the normal wear of commutator brushes can cause considerable trouble, especially when there is a binding agent such as oil or water vapor. Carbon paths are formed across insulated areas, resulting in short and grounded circuits.

The ordinary type of dirt causes more trouble in the control circuits and power switch gear. Small particles of dust can cause trouble completely out of proportion to the size of the particle. A small particle of dirt in any one of the interlocks in the system can cause a malfunction of the locomotive. Control circuit interlocks were designed with adequate "wipe" to brush away particles and complete the necessary circuit.

In spite of this we were plagued with interruptions in service and early failure of the control and power circuit interlocks and contactors because of this wipe. Dirt particles in unfiltered air act as an abrasive and cause wear of contacts.

### Air Filtration

In 1941 it was decided to equip certain locomotives with car-body filters to filter all air entering the car body. These applications were first made on freight locomotives, reducing the engine room dirt. The panel filter itself, as well as the design of the application, was subsequently improved. New panels of a non-plugging design were developed. Today, applications of this type are standard equipment on all road and road switcher-type locomotives.

Improved air quality has brought about newer designs in relays, interlocks and contactors. Some are smaller, less expensive and more trouble-free. The dust remaining in the filtered air is now of a small particle size, but it can cause trouble. We still need good wiping action and surfaces that are not prone to cinder formation. Newer interlocks and some heavy-duty contacts are silver plated or have a silver inlay.

In addition to carbody filters, there are some designs of air filters that can be applied to main generators and traction motors. The presence of a binder causing dust or dirt particles to cling to insulated parts and creepage surfaces is a problem. Attempts have been made to use the conventional 2-in. impingement filter as a dry element to stop oil, water vapors, and dirt from entering the machine. It might be more practical to reduce or eliminate the vapor from the air. Principal sources of moisture-carrying vapors in the engine room are the engine exhaust system, the steam generator and the air compressor. By maintaining these items properly, most of the moisture can be kept out of the electric equipment.

### Filtration Methods

A representative diesel engine will require approximately 15,000 cfm of air during full-load operation. Carbody filters improve locomotive performance but are not without disadvantages. The principal difficulty is that a negative pressure is produced within the carbody. This means that any small hole even drain holes, will actually become a point of admission of unfiltered air.

The solution could be complete pressurization of the carbody by the use of a skimmer-type blower. Fairbanks-Morse built three such locomotives.

In time, these applications may provide many answers regarding the benefits of filtered air to electric equipment. The basic idea is good, and could be justified, not only by reduced maintenance costs, but also by better performance. The skimmer blower is a roof-mounted blower drawing in outside air through a roof opening. It is a squirrel cage-type blower that by-passes part of the air it draws into the carbody. Dust particles, being heavier, are spun to the outside of the discharge opening of the blower where they are skimmed off and discharged outside the cab. The clean air is admitted directly to the engine room. The capacity of the blower being greater than the air requirements of the locomotive enables it to slightly pressurize the carbody. There are no carbody filters or other openings by which air can enter the engine room.

A similar idea is used in the winderization hatch, furnished by EMD. This hatch utilizes existing equipment on the locomotive and can allow unfiltered air to enter the engine room. EMD has also used a "snorkle" design for export locomotives. This application provides full filtration of engine room air.

Because of the design problems and cost of application these systems are best applied to new locomotives while in production.

### Main Generators

The main generator problem on the Santa Fe has been evaluated through test applications of impingement-type filters. We found minor differences in the dirt deposits between those generators equipped with filters and those not equipped. The filters were used both dry, and coated with conventional plasticized filter saturant. We have never been able to detect any difference in the over-all operation. Use of filters brought two unexpected problems: small pieces of the filter would break off and mark the main generator commutator, and pieces of dirt would drop off the filter into the generator damaging brushes and and commutator. Excessive oiling of the filter could result in the saturant being pulled into the generator to collect dirt especially at higher engine-room temperatures experienced in our desert operation.

The test was terminated with the conclusion that the cost of the application could not be offset by measurable savings. Other railroads with problems, different or more severe, have found such filtration desirable.

Diesel units equipped with steam generators experience more electrical difficulties from moisture grounds. Statistics show that 45.8 per cent of the traction motor grounds or short circuits, on a unit equipped with a steam generator, occur in the No. 4 traction motor directly below the steam generator. In-

*An abstract of the paper "Practical Air Filtration for Diesel Locomotives," presented by M. B. Adams, general supervisor diesel engines, Atchison, Topeka & Santa Fe, at the Joint ASME-AIEE meeting in Cleveland on April 9, 1958.*

cipient steam and water leaks not only result in moisture draining onto the traction motor; but, steam leaks adjacent to the traction motor blowers are in the air stream into the fan. Steam drawn into the motor condenses on the brush box insulating studs.

Dirt conditions in traction motors are worse than in generators because of their location. The presence of moisture aggravates the possibility of grounds. To prevent the entrance of moisture, designs are now available to extend the point of air intake to a location higher in the carbody. Steps must be taken to seal the traction motor air duct opening against water that may be found on the engine room floor.

**Control Cabinet**

In 1953 a "sealed cabinet" project was initiated on the Santa Fe with one of our then new F-7 locomotives. Electric cabinets were to be operated from monthly inspection to monthly inspection without being opened and inspected. The equipment included new cam switch contacts; new enclosed motor shunting contactors; new parallel relay, battery field and shunt field relays; and a new battery charging contactor. These relays and contactors, together with the power contactors, were equipped with new, enclosed, interlock assemblies.

This project ran for about three years. Several difficulties were encountered. The initial difficulty was the education of maintenance and operating people to respect the seals on the electric cabinet doors. Eventually, our maintenance force did respect the seals and quite good performance resulted. Much of the equipment to come out of this test has since become standard. We were never able to operate for extended periods without "blowing" the cabinets. It was always necessary to blow the dust out of the cabinets, clean and lubricate the reverser make the routine inspection for visible defects. In some cases it was necessary to dismantle and clean the sealed interlock assemblies. In spite of the improvements to come out of the test, we have not been able to dispense with basic electrical maintenance and periodic cleaning.

**Diesel Engine**

Evaluation of the cost of dirt elimination in diesel engines can be more definite. Wear of the internal parts is a direct result of dirt getting into the engine. There are some variables, such as the condition in which the lube oil is maintained and average engine temperatures. Low cooling water temperature can result in high wear rates.

The conventional 2-in. impingement-type panel has been replaced with a 4-in. panel-type element to provide better filtration and extend the change-out periods. This filter does do a better job. We have found uniform performance from the Rotonamic-type filter and are using it on nearly all new filter applications. The 4-in. filters replaced by the Rotonamic are applied to yard engines to give them better protection, and the 2-in. filters are being used in carbody filter applications.

In much Santa Fe territory from central Kansas to Texas and New Mexico, very severe dust conditions exist. We find impingement filters overloaded after only a few hours of operation. Daily changes are required, but are impossible from the standpoint of having enough clean filters and of having the locomotive available for filter changes. This results in severe dirt conditions in the engine. During severe dust storms, properly saturated impingement-type filters become dry and allow dirt to enter the engine, causing excessive ring and liner wear.

Under these conditions, we have found it beneficial and expedient to use the Rotonamic filter, a self-cleaning element using the "centrifuge" principle. It is quite efficient when handling dirt sizes above the 5 micron range. Our tests indicate that particles below this size will not contribute appreciably to engine wear.

Tests to compare engine liner wear in engines using the Rotonamic filter with those using the 4-in. impingement filter indicate that the 4-in. filter will do a good job as long as it is well maintained. Liner wear will reach approximately 0.11 in. at the point of maximum ring travel in two years of heavy freight service during which the unit travels approximately 224,450 miles. In this period the locomotive has had about 40 filter changes of 16 filters each. It has been determined that it costs about 37 cents per filter to remove, clean, re-oil, and re-apply. This cost, equated to the annual mileage of the unit, gives a filter maintenance cost of 0.105 cents per mile.

**Cost Comparisons**

When establishing a basis for calculation of engine maintenance cost as compared to the cost of air filtration, it must be remembered that there are many variables producing engine wear. In a damp tropical climate very little airborn dirt would be presented to the engine or the filters. In the "dust bowl" great quantities of abrasives must be filtered out. From experience with various filtration methods and tests of engine wear patterns, it seems acceptable to estimate a 50 per cent reduction in engine wear because of good air filtration. A total absence of engine air filtration would require assembly renewal in EMD engines yearly instead of every two years as is done at present. During this time, half of the liner life would be lost, piston rings would be worn out and probably exhaust valves would require replacement.

Considering the EMD 16-cylinder, 567-B engine, cost of operation without filters should increase about 0.53 cents per mile. This assumed cost is not the most satisfactory method of determining the savings from air filtration. The only way to improve upon it is to actually test the engine on unfiltered air. No one today could afford to take the risk or pay the cost. Actually, additional costs should be considered—availability, interruption in service, and increased handling charges. These are really not necessary for we are interested in tangibles only. The intangibles would only increase the already prohibitive cost of unfiltered air.

Dirt entering the engine because of poor engine-air filtration finds its way into the lubricating oil, causes wear of other engine parts and throws an increased load on the lube oil filters. Filtration of air for combustion and filtration of lubricating and fuel oil are the most important items of routine maintenance in the diesel locomotive.

In considering the cost of air filtration for the electric equipment, the yearly cost for filter maintenance of $118.40 is reduced by that portion applying to engine air filters. This results in a cost of carbody air filtration of $76.96 per year for protection of electric switch gear and the various control relays. The corresponding cost per mile for this protection is 0.0685 cents.

The direct evaluation used in the diesel engine wear versus filter cost relationship is not readily applicable to the electric system. Electrical failures due to dirt in contacts or interlocks can be quite costly. It might be necessary to send an electrician to make corrections at the point of failure. Cleaner air is sure to result in fewer road delays and fewer worn or burned parts. Even so, it is a real problem to make a direct statement as to the number of road failures that would be eliminated or the extension of life to the various parts. Current prices of contact tips and interlock fingers along with applications costs for various EMD parts total $739, broken down as follows: cam switch — $217.50; reverser —$360.00; power contactors—$114.50; and auxiliary relays—$47.00. It is difficult to establish a normal life expectancy for these parts. We can only estimate what our savings may be. Annual savings of only one tenth of the replacement cost would be attractive. It is regrettable that a more definite method of fixing costs of dirt in electric equipment is not available. It remains to be established.

*What B&O Tests Showed . . .*

# Electrostatic Precipitator Cleans Engine Air

THE FIRST EXPERIMENTAL design and application of an electrostatic precipitator as a locomotive engine air cleaner has operated successfully in regular service for two years on the Baltimore & Ohio. Engine part wear was significantly reduced. Maintenance was not difficult and conformed to normal practices used in railroad shops. The precipitator operated without any major changes; its failures were minor and easily corrected.

All the problems are not solved. High, and in some areas excessive, air velocities through the collectors progressively reduced particle collection efficiency during the first 15 days from 98 to 93 percent. Efficiency dropped rapidly after that. Along with tests of the efficiency and operation of this electrostatic equipment, it was hoped that the precipitator with its high efficiency air cleaning ability would help answer the following:

- What is the extent of wear when all, or nearly all, road-dust abrasives are kept out of an engine and it is then subject only to so-called mechanical wear?
- How much longer will the engine operate between overhauls when airborne abrasives are eliminated?

The problems of designing an electrostatic precipitator that would meet the engine air intake requirements and fit the space available to it were solved by Westinghouse Electric and the B&O late in 1954. The installation was made in February 1955, on a 1500-hp, 16 cylinder, GM engine requiring 5,400 cfm of combustion air. Concurrent with the electrostatic precipitator test, the B&O was also testing air filters of the oil-bath, air-cyclone, and standard impingement type which provided direct comparison with the electrostatic type air cleaner (Railway Locomotives & Cars, April, 1956, p. 45).

During the first six months in field service the filter efficiency was studied and maintenance schedules were developed while the locomotive operated about 175 miles per day. The locomotive completed its two years of regular road service on the main line tracks of the mountainous Eastern Region. Two power assemblies—liners, pistons, and rings—were measured at the completion of one year's service and the balance of the assemblies were measured at the end of the two years. Some maintenance points, unfamiliar with the test equipment, were unable to make necessary repairs and the precipitator was inoperative for short periods of locomotive operation. On several occasions the test locomotive was unable to return on time to its assigned maintenance terminal for regular 15-day maintenance.

An electrostatic precipitator first charges air-borne particles and then electrostatic precipitation of the particles takes place. Dirt particles are charged by passing them through a field of unipolar ions. In general it can be said that the quantity of charge a particle received varies with the electric field strength, the concentration in the ion field and the time the particle is exposed to the field.

Particles charging is generally accomplished by two electrodes. The "passive electrode" is a surface of relatively large area such as a plate or tube. The "active" or "emitting electrode" is of relatively small area, such as a fine wire.

There are two general types of this precipitator. The first is the single stage in which both charging and precipitation are performed by a single electric field. An example of this would be a pipe with a small wire running axially through the center. Here the active electrode is at high voltage while the tube may be at ground potential.

The second type is the two-stage precipitator. Ionization and precipitation are accomplished in two steps. The ionizer consists of tubes or flat plates serving ground electrodes and spaced equally across the path of air flow with small diameter wires strung between each pair. Some precipitation occurs here.

The collector stage consists of a number of flat plates equally spaced across the air flow path orientated so dirt-laden air will pass between adjacent plates of opposite potential, thus setting up a precipitating field. Oil is applied to collector plates to retain the dirt which loses its charge when precipitated.

**Engine Wear Over Two Year Period**
**All results in inches**

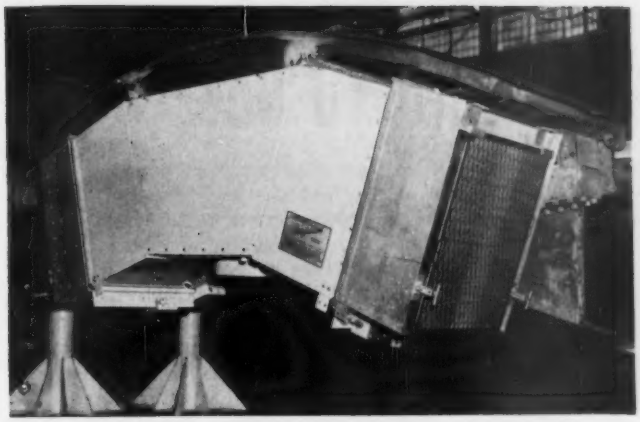
| | Test Engine with Percipitron | Control Engine with Standard Air Filtration |
|---|---|---|
| **Ring gap:** | | |
| No. 1 compression rings | 0.036 | 0.072 |
| No. 2 compression rings | 0.021 | 0.047 |
| No. 3 compression rings | 0.017 | 0.041 |
| No. 1 oil rings | 0.025 | 0.082 |
| No. 2 oil rings | 0.021 | 0.073 |
| **Ring side wear:** | | |
| No. 1 compression rings | 0.0002 | 0.0056 |
| No. 2 compression rings | 0.0000 | 0.0012 |
| No. 3 compression rings | 0.0000 | 0.0004 |
| **Ring groove wear:** | | |
| No. 1 compression rings | 0.0027 | 0.0047 |
| No. 2 compression rings | 0.0011 | 0.0015 |
| No. 3 compression rings | 0.0008 | 0.0010 |
| **Cylinder liner wear:** | | |
| At 1-9/16-in. level | 0.0047 | 0.0071 |
| At 6-in. level | 0.0034 | 0.0045 |

### Locomotive Application

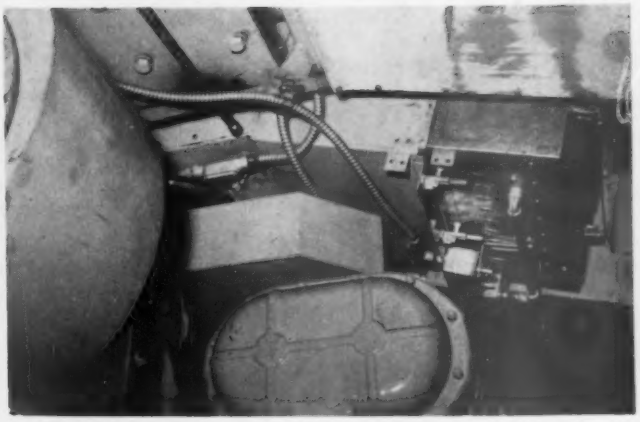
The two-stage precipitator actually used was applied to a manifold attached to the two engine intake air blowers. A precipitator was attached to each end of a common plenum chamber and the whole assembly supported from the main roof hatch. A flexible duct connected the manifold to the plenum chamber. The ionizer and collector cell were constructed almost entirely of aluminum. Flat plate ground electrodes were used. The collector plates were supported on rods with spools to space them uniformly apart. The plate assemblies were clamped tightly together to insure rigidity and good electrical contact between plates of like polarity. The components to be removed for cleaning could not weigh over 50 pounds to allow handling by one man. Safety devices had to be provided for high voltage protection of personnel. The unit had to be sufficiently rugged to withstand vibration normally occurring in the engine.

Electric power was supplied to the unit by a standard 100-volt, 60-cycle commercial high-voltage power pack supplying 12,800 volts dc to the ionizer and 5,800 volts dc to the collector cells. The power pack was fitted with resilient mounts for vibration protection. The power pack and a 110-volt, 60-cycle, 500-watt motor-generator set operating from the locomotive's 64 volt dc current were mounted in the dynamic brake hatch.

*An abstract of the paper "Field Experience with Electrostatic Precipitator on Diesel Locomotive Engine Air Intake," presented by P. Kangas and W. C. Kern of the Baltimore & Ohio, and E. L. Richardson of the Westinghouse Electric Corporation, at the Joint ASME-AIEE Meeting in Cleveland on April 9, 1958.*



Precipitators were supported from the dynamic brake roof hatch and fed a common plenum chamber from which both engine blowers took their air.



Impingement filters on Precipitron air intakes kept papers out of the device. Having concluded tests, Baltimore & Ohio has now removed all this equipment.

**Precipitron Maintenance**

Maintenance of the electrostatic precipitator was relatively simple because two complete sets of collector cells and ionizers were used. One set was in service while the dirty set was held in the shop for cleaning and treatment. The time required for two men to change out the electrostatic precipitator parts was about twenty minutes. The parts were not too large for one man to handle but it was safer when two men performed this work.

Cleaning of the dirty ionizer and collector cells was done either with a steam jet gun using a soap solution designated for cleaning aluminum parts or by dipping them in wash tank and then rinsing clean with water. When dry, the collector cells were dipped in a filter treating compound to insure that dirt particles would stick to the collector cell plates.

No trouble was reported during the test period due to blow off dirt caused by vibration or electrical arc-over between the collector plates.

Two surge limiting resistors in the power pack failed and had to be replaced. Failure of these resistors was not believed to be due to vibration or heat.

Two troubles were reported with ionizer insulators. Some were broken apparently by dropping the ionizer or by malfunctioning of the cable connector. Corrosion products around the insulator caused short circuits. Insulators of a more suitable design were installed. During the test several ionizer wires broke and were replaced.

Bearing failure on the dc motor of the motor generator supplying power to the precipitator power pack resulted in the precipitator being inoperative for 15 days.

It was reported at the shop that the precipitator required frequent maintenance of a minor character. On several occasions the precipitators failed to function on reassembly after cleaning and had to be taken down. The frequency of this decreased with experience. It was also reported that on ten occasions the locomotive returned to the shop with precipitators not operating. Four of these were due to the motor generator set, and the others could not be identified.

**Precipitator Efficiency**

The tests indicate that with oil-treated collector plates the efficiency by count ranged from the initial efficiency of 98 per cent to about 93 per cent when the collectors had been in service 15 days and after 30 days the efficiency had decreased to about 40 per cent. This drop in efficiency made it necessary to change out the collector cells and ionizers every 15 days in order to maintain a high efficiency. This matched the semi-monthly inspections of engines.

Test runs made with untreated or dry collector plates showed no significant difference in efficiency with those that were coated with a tacky oil. The deposits on the collector plates in both cases were similar in appearance and subsequent analysis showed them to have coatings composed of airborne dirt, carbonaceous material and over 50 per cent by weight of oil. It was evident that the electrostatic precipitator was collecting the oily vapors of the diesel engine room.

The two-year wear data for the test engine are compared with wear data derived from the control engine equipped with the standard 4-in. panel filters.

The average cylinder liner wear shows a reduction of 34 per cent at the 1-9/16-in. level and 25 per cent at the 6-in. level. In terms of out-of-round wear, only two test engine cylinder bores were found to exceed the limit of .005″ compared to 12 from the control engine.

Compression ring wear, measured as gap increase, showed an average reduction of approximately 54 per cent for the test engine. Oil ring wear was reduced in the test engine by as much as 70 per cent.

Most maintenance problems encountered during the testing of the electrostatic precipitator could undoubtedly be eliminated by improvement in materials and design. A prime objective for any future design would be to extend the high degree of efficiency obtained during the initial 15-day period to a service period lasting 30 days.

A good indication of the air cleaning efficiency of the electrostatic precipitator was apparent when an inspection of the plenum chamber showed no dirt deposits after going uncleaned during the entire two-year test.

Dirt deposits on the collector plates, as well as on the ionizer plates, adhered tenaciously to the surfaces. Evidently the precipitator collected all airborne particles including oily and carbonaceous components of the railroad atmosphere. Such deposits could not be removed by pounding or vibrating plates.

The test engine parts were examined visually and found exceptionally clean in comparison to control engine parts. The rate of engine deposits, therefore, seemed to correlate with parts wear. It was generally agreed that the test engine could have continued to operate efficiently well beyond the normal two-year overhaul period based on the wear rates experienced.

*Look at Your Locomotive Fleet . . .*

# How Much Cleaning Can You Afford To Do?

## PROBLEM:

To obtain a direct return from every dollar invested in cleaning.

## SOLUTION:

Take a realistic view of cleaning and adjust schedule to actual need.

### Balance These Advantages and Disadvantages:

**Advantages:**

1. Improved reliability. Clean equipment is subject to fewer failures than dirty equipment. This means improved transportation efficiency.
2. Improved safety. Clean locomotives are easier to inspect, less susceptible to fire, and safer for operating personnel.
3. Improved economy of operation. If cleaning is properly performed, overall maintenance costs should be minimized.

**Disadvantages:**

1. Cost. Cleaning is, to a large extent, a manual operation. It can become a relatively large item in the maintenance budget.
2. Out-of-service time. Locomotives being cleaned are generally unavailable for either maintenance work or for use.
3. Intangibility of benefits. It is seldom possible to determine exactly what return is obtained on money invested in cleaning.

CLEANING can be the most valuable investment a railroad makes—or the most useless. The secret of economical cleaning is to perform only the necessary cleaning, at the proper location, and at the right time.

The impression has grown that cleaning has ceased to be a maintenance item and has progressed to the state of an art. Seldom has there been an attempt made to view the subject in its proper perspective. Cleaning is an important, but frequently exaggerated phase of preventive maintenance. There is much more to it than cleaning alone.

Incredible as it may seem in this day of precise measurements, there is no absolute standard by which to determine cleanliness. In practice, the term can be used only in a comparative sense. For instance, a house is "clean" in comparison with other houses; a machine shop is "clean" in comparison with other machine shops. A "dirty" house might be "clean" in comparison with a clean machine shop. To make a machine shop as clean as the house would involve prohibitive expense and serve no good purpose.

This principle applies equally well in the case of locomotives. It may prove interesting and valuable to examine current practices in this light. Railroads may have developed their own ideas of what constitutes a clean or dirty locomotive; a clean or dirty engine room; or a clean or dirty high-voltage cabinet. Practical considerations might show need for changes in present practices that would improve performance and reduce costs. The balance must be struck between the danger of high costs resulting from unnecessary cleaning and that of high costs for the repair of damage caused by neglect of proper cleaning.

**To a great extent, cleaning is simply the removal of foreign material which might have been kept out of the equipment in the first place. Failure to evaluate conditions surrounding locomotive operation and the type of locomotive has led many railroads to do too much or too little cleaning. These can be avoided only by studying individual cases.**

A certain amount of cleaning is absolutely necessary. ICC rules require that decks be kept clean of oil and dirt and that hazardous oil accumulations be removed. Depending upon the local inspector, these rules may cover many or only a few items. Safety demands a minimum standard of cleanliness for running gear to permit rapid, accurate inspection for broken or worn parts.

Inspection of locomotives belonging to various railroads indicates that there is seldom agreement on the amount of cleaning required, but it is evident that as labor costs continue to rise, less and less cleaning is being done.

### Economics of Cleaning

Cleanliness in a locomotive can be measured in actual dollars. The laborer who performs most of the heavy cleaning receives an hourly basic wage of $1.96. Overhead and benefits bring his hourly cost to the company to over $2.50. A mechanic who performs engine repairs, inspection, and specialized cleaning costs about $3.15 an hour, including overhead.

In a typical freight locomotive pool, a unit returns to its home terminal six times during a 30-day period. Exterior cleaning, wiping up oil leaks, changing car-body filters, mopping the cab, and similar labor will require a minimum of five man-hours on each layover. This means $75 monthly for a minimum of home terminal cleaning. A railroad with 100 freight units would spend $7,500 monthly for labor to wipe up dirt and oil!

Cleaning is constantly repeated, and the cost can quickly become excessive. This is especially true if cleaning is substituted for maintenance. The $75 minimum monthly expenditure can quickly jump to $300 if oil leaks are ignored and intermediate terminals must continually wipe oil off the engine room deck to comply with ICC requirements. Money consumed here by excess cleaning costs would be better invested in engine repairs.

Consider what would happen if a more thorough cleaning were required. If this consumes six hours instead of five, the cleaning bill for 100 units will be increased to $9,000 monthly. The additional cleaning must produce a return that will offset the extra $1,500 it costs.

**At a location maintaining 100 units per month, it is entirely possible that supervision is spread so thin that a 5-hour cleaning job requires 6 hours.**

*An abstract of the paper, "Practical and Economic Limitations of Cleaning Operations on Diesel-Electric Locomotives," by D. H. Noble, Chicago, Rock Island & Pacific, and B. L. Judy, General Electric Company, at the Joint ASME-AIEE Railroad Conference in Cleveland, Ohio, on April 9-10, 1958.*

**An additional foreman at $600 per month would more than justify his salary if he could reduce cleaning time by one hour per unit. This is a point too often ignored during maintenance force reductions.**

The mechanic, a higher paid specialist than the laborer, must also do some cleaning. Electricians must keep motors, generators and controls clean to insure dependable operation. Much of a mechanic's cleaning is associated with inspection, testing and repair work. It is difficult to segregate actual cleaning time. An hour of mechanic's time spent cleaning carbon dust off a traction motor string band might prevent a flashover and save a $1,000 armature rewind; but to clean the same dust off the motor exterior would be a waste of time.

The type and location of dirt is one key to the necessity of cleaning. A little dirt under a connecting rod bearing can mean the cost of a new crankshaft. The same dirt on the outside of the engine would be utterly harmless. A grain of sand on an interlock contact may result in a road detention, while the same grain in the bottom of the high-voltage cabinet could not even be seen. In locomotives it is not cleanliness, but cleanliness in the right places, that pays off.

Too little, or poorly directed, cleaning will increase equipment failures. More of the maintenance budget will be syphoned into repairs and trouble shooting; less will be available for useful preventive maintenance. Too much cleaning can quickly devour an equally large share of the maintenance budget.

### Fundamentals of Cleaning

Though cleaning may not, of itself, be maintenance, it can prevent a large amount of maintenance. Dirt, grease and oil fumes are enemies of electric and mechanical equipment. When kept clean, a large percentage of failures will be avoided. The benefits of cleaning mechanical equipment are rather difficult to evaluate. Beyond the minimum required by ICC rules and safety considerations, this area is open to question. Wear of parts is affected by dirt. The psychological effect of clean equipment is intangible; but a good mechanic tends to do a better job on clean equipment. While no dollar value can be placed on this, it is a compelling reason for keeping locomotives as clean as practicable.

### Engine Room

Vital parts of the diesel engine are well protected from dirt. Dirt is most likely to find its way to them in the air, fuel and lubricating oil. It is difficult to correlate engine room dirt to engine wear. It stands to reason that engine room dirt will eventually reach either wear surfaces in the engine or the electric equipment. Even such a simple task as refilling the governor invites failure when the engine room is so grimy that dirt is carried into delicate parts. This is clearly evident from the large number of hunting governors found on dirty engines.

Engine room dirt is oily—particularly bad for electric equipment. Excessive blow-by in the engine will frequently result in an oil-soaked generator. In certain locomotives, this may only be cleaned by removing the generator, and a simple cleaning job becomes a major project. Small air piping leaks can blast oil into locations where it will do a great deal of harm. Any means of eliminating oil vapors will make cleaning simpler.

### Electrical Equipment

The most immediate return from a suitable cleaning program is found in the electric apparatus. Flashovers, grounds and similar failures are directly related to dirt. Dust usually found around railroads is a good conductor of electricity. If it accumulates on insulation creepage surfaces, it will cause failure. Periodic cleaning of insulation surfaces on motors and generators is good preventive maintenance. Keep as much dirt as possible out of the machines by maintaining filters in good condition and do a thorough job of getting rid of the dirt that does enter.

When the dirt is oily, no amount of blowing will remove it. It must be washed away with solvent. When possible, it is preferable to wipe the equipment with a cloth dampened with solvent, rather than to spray or wash it. The most difficult type of dirt to remove is the smoke-like deposit of fine carbon. It cannot be blown or washed off. The only way to get rid of it is by scrubbing. In inaccessible places, this is best done by an abrasive blast.

There is a strong temptation to paint insulation instead of cleaning it. This is the worst possible mistake. The layer of conducting dirt is still under the paint, and the current breaks through just the same. The difference is that now the dirt cannot be removed by cleaning because it is protected by the paint.

### Control Cabinet

Most of the control equipment is located in the high voltage cabinet and is fairly well protected. Occasional judicious cleaning may be required, but misdirected or over-cleaning can do great harm. Air-operated, heavy-duty power contactors have components capable of carrying large currents, along with interlocks which perform secondary functions in the control circuit. These are small and capable of carrying only light currents. The design and size of the power contactors means they are little affected by ordinary dirt unless it is highly conductive. Most interlocks are designed so that their contacts are vertical, shielded, or enclosed. Only clinging dirt—such as oil-soaked dust—will cause trouble in open interlocks. Normally, very little oil should find its way into the cabinet, so very little cleaning of the contactors should be required.

A careless worker with an over-active oil can may create a real cleaning problem. If excessive oil is added to contactor air cylinders, it will be blown out through the exhaust ports of the magnet valves as a fine spray that settles on all nearby equipment. Cleaning contactors in this condition is impossible without removing them from the compartment.

Careless cleaning of the contactors can cause trouble. If they are washed with cleaning fluid, dirt will be carried into crevices in the insulation where it may cause a breakdown. The cleaning fluid may get into the air cylinder where it will ruin the lubricant, attack packing, or corrode metal surfaces. This would result in a sluggish or inoperative contactor. Careless movements can be responsible for trouble. A coat sleeve caught in an interlock can bend it, causing faulty operation.

As far as contactors are concerned, it appears that no cleaning at all would be better than incorrect cleaning. An occasional blowdown with low-pressure air should suffice. In areas where sand storms are encountered, more frequent blowdown will be necessary to prevent the accumulation from interfering with the mechanical operation of the equipment. Under certain circumstances, vacuum cleaning may be necessary but it is more expensive and less practical.

Reversers and cam switches are much like the power contactors and require little or no cleaning. Their main contacts will bear watching. When the device operates, contacts have some sliding motion which tends to drag oily dirt along and deposit it at the end of the contact travel where it tends to build up and dry. If the finger rides up on this deposit, the resultant arcing will burn the contact surfaces.

Oily dirt can cause trouble on the insulation surfaces of these devices where it may cause a ground or creepage failure. Surfaces can be wiped with a cloth soaked in an oil solvent when it is necessary to remove the dirt. The real solution is to avoid over-lubrication. The various relays—enclosed, shielded and open—are much like interlocks. Cleaning can do little for them, and careless

(*Continued on next page*)

cleaning can do much harm. Resistors, rectifiers, transformers and capacitors are so built that dirt has little effect on them, and cannot prevent their working. Large buildups of dirt could possibly cause some overheating. An occasional blowdown with low-pressure air is all that is required.

There is the temptation to paint instead of clean. Paint may inadvertently get onto the contact surfaces of the equipment. Worse than a brush is a paint spray. The fog of fine droplets it produces can settle on contacts of relays and interlocks, causing intermittent failures which are nearly impossible to find. The temptation to repaint the high-voltage cabinet simply to dress it up should be resisted.

### Shop Schedules

Many cleaning and painting operations can be safely performed during general repairs that cannot or should not be done at other times. Removal of the main generator permits thorough cleaning and painting of the generator pit, and revision of drainage to prevent future oil accumulations. Wiring in locations where oil and moisture are excessive can be replaced with neoprene-jacketed cable. Delicate relays can be relocated where they will be better protected. On one design of locomotive, moving the engine temperature controls from the front hood to the electric cabinet eliminated failures of this equipment caused by dirt, oil, and moisture.

Anything that can be done during shopping to reduce the possibility of oil leaks will reduce future cleaning costs. Frequently, slight changes in materials or methods will prevent such failures. Oil lines which are especially subject to breakage may be relocated so that a rupture will not pour oil on electric equipment, or in a location where it cannot be readily wiped up. On one group of locomotives, a small oil line originally passed directly above the front traction motor blower. Fatigue failure of the tubing would result in several gallons of lube oil saturating the traction motor before the leak was discovered. A simple rerouting of this line immediately ended a costly series of traction motor failures.

Painting is safe while equipment is out for reconditioning. A fresh coat of gloss paint will not only improve engine room appearance, but give a smooth surface upon which dirt cannot easily adhere.

Every effort should be made to have the backshop turn out a locomotive that will run with a minimum of enginehouse attention until the next shopping is due. It is uneconomical to outshop a locomotive with a new generator coupled to an engine badly in need of resealing.

Shop modifications can be made that will permit more effective cleaning methods. Neoprene wiring, proper selection of conduit and junction boxes, and minor changes in electric cabinets will frequently permit spray cleaning of the engine room without danger to electric equipment. If Woodward governor connections are made with neoprene-coated flexible conduit and watertight fittings, the front of the diesel engine can safely be sprayed, and many dirt pockets not readily accessible to hand wiping can be reached.

Obviously, sound economic policy dictates consideration of means of reducing the need for cleaning. The primary consideration is not the frequency or extent of cleaning, but rather the results accomplished. Too much cleaning, or incorrect cleaning is uneconomical and can cause new troubles. Too little cleaning may result in sharply increased maintenance expense.

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### Diesel Dirt Costs $138 Million

(*Continued from page 29*)

that the diverse causes of electrical faults would probably make dirt damage of only half as much importance there as on diesel engines. Finally, cleaner electrical equipment would not extend the periods between locomotive overhauls because diesel engine condition controls this. These factors were combined to produce a dirt cost on electrical apparatus of $23,364,938.

Other losses which individually are small, mount up rapidly, when added together. These include such things as poorer heat transfer in dirty radiators, damage to carbody exterior finish, fire damage and wear between moving surfaces. All of this is bulked under "dirt on other portions" and was estimated to amount to $38,104,867 annually.

| FAULT \ CAUSE | Dirt and/or moisture | Excessive gear wear | Broken Brushes | Improper grade of brush | Improper workmanship | Age or Wear | Improper lubrication | Bearing Failure | Poor design | Overloading unit | Slipping wheels or overspeed | Brake shoe sparks | Loose Pinion | Malfunctioning of controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Armature winding shorted or grounded | ● | ● | | | ● | ● | | | | ● | | | | ● |
| " " to be replaced | ● | ● | | | ● | ● | | ● | | ● | ● | | ● | ● |
| " bands damaged | ● | | | | ● | ● | | ● | | | ● | | ● | |
| Commutator flashed | ● | ● | ● | ● | ● | | | | ● | ● | ● | | ● | ● |
| Commutator grooved | | | ● | ● | ● | ● | | ● | ● | ● | | | | |
| Commutator loose | | | | | ● | ● | | ● | ● | | ● | | ● | |
| Commutator to be renewed | | | ● | ● | ● | ● | | ● | ● | ● | ● | | ● | ● |
| Broken brushes | ● | ● | | ● | | | | ● | | | ● | | ● | ● |
| Brushholders elect. damaged | ● | ● | ● | ● | ● | | | ● | | | ● | | ● | ● |
| Brushholders Mech. damaged | | | | | ● | | | ● | | | | | | |
| Field coils shorted | ● | ● | | | ● | ● | | ● | | ● | | | | |
| Field coils grounded | ● | ● | | | ● | ● | | ● | ● | ● | | | | |
| Field coils roasted | | | | | ● | ● | | | ● | ● | | | | ● |
| Field coils loose on pole | | ● | | | ● | | | ● | ● | | | | | |
| Armature bearing damaged | ● | ● | | | ● | ● | ● | | | | ● | | | |
| Loose pinion | | ● | | | ● | ● | ● | | | | ● | | | ● |
| Motor support excessive play | | ● | | | ● | ● | | ● | | | | | | |
| Burnt wires and cables | ● | | | | ● | ● | | | ● | ● | | ● | | ● |
| Control and power grounds | ● | | | | ● | ● | | | ● | ● | | | | |
| Malfunctioning of controls | ● | | | | ● | ● | ● | | ● | | | | | |
| Control and power cabinet fires | ● | | | | ● | | | | ● | ● | | ● | | ● |

**Common electrical faults on diesel electric locomotives and possible causes were outlined by Mr. Horine in conjunction with his study of the cost of dirt. This illustrates the complex problems of determining exactly what role dirt does play in deterioration and unreliable operation, and the difficulty of assigning exact costs.**

# Pete's Average Goes Down

by Ken Wright

"Jim", stormed Pete, "did you drag me away from my bowling just to tell you this car was out of fuel?"

Apex Cold Storage Plant had asked for a mechanical refrigerator car to load with frozen chickens. The car was to be precooled, but the plant manager wanted the equipment shut down while the loading was going on. When the car was spotted at the loading dock about 9 am, the manager noticed that the refrigeration equipment was already shut down. He thought this rather strange, but assumed that it had been done over in the railroad yard just prior to delivery. After all, the temperature inside was eight below zero.

It was afternoon before loading began and by then the car's temperature had risen several degrees. When the side door was opened, cold air inside spilled out and was replaced by the warm outside air. Even though a canvas tunnel was used to connect the car door to that of the warehouse and, although the car was rapidly filled with chickens brought from five below zero storage, the temperature of the mechanical reefer was quite high by the time loading was completed and the door closed. The manager had had some experience with starting and stopping the equipment on these mechanical cars. He tried to start the diesel engine and failed. After several attempts, he gave up and called the railroad, stressing the necessity for immediate action. The car's temperature was rising to a dangerous point.

The clerk who took the plant manager's call was not sure what to do. Everyone he called came up with answers like "I don't have anything to do with those cars!" or "Not my baby. Might try Jones." Finally, the freight agent, who was in on it by now, contacted Big Jim who admitted that it probably was his job. His man, Pete, had done work on another mechanical car recently. Jim was advised of the urgency and was told the location and number of the car.

Big Jim knew he was in a spot. His best man, Pete, had just finished work for the day and was on his way home. The men on this trick were willing enough workers, but definitely not the best trouble shooters in the world, or even at this terminal. It seemed too bad to send two men to look at the car, but it might be safer. Sometimes two heads are better than one.

Tony and Mike started out for the Apex plant with as many instructions as Big Jim could give in five minutes. On the way, Tony and Mike confessed to each other their complete ignorance about mechanical reefers. "Well," Tony consoled himself, Jim said there was an instruction book on the car, and I guess we can read that."

The first minutes after arrival at the car were spent looking it over and identifying various parts. Finally it was agreed that they had to get the engine started first. They tried cranking the engine by pressing the Start button. It turned over with the starter but showed no other signs of life. After about an hour and a half, Tony said that he was going to call Big Jim and tell him that they were getting nowhere.

Unconcerned about what might be said concerning overtime, Big Jim went to the phone and called Pete's house. Pete had left to go bowling—this was his league night. Jim jumped into his car and headed for the bowling alley. Of course, as soon as Pete saw Big Jim, he started complaining. "It always happens—something to spoil the fun. What's wrong now?"

Big Jim told him as much as he knew about the ailing car. He attempted to placate his ace trouble-shooter, saying that maybe Pete could fix the car and still get back to the bowling alley in time.

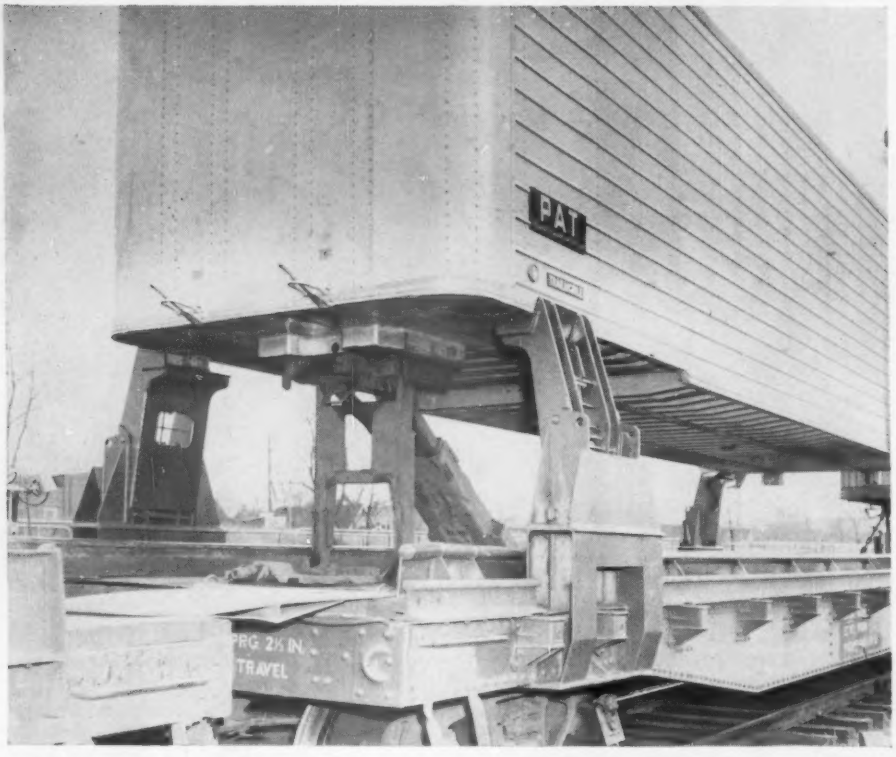
"You dreamer, you!" growled Pete. Big Jim drove Pete to the storage plant a bit faster than the law allowed. Arriving at the car, Jim asked Tony and Mike what they had done. From the replies, it seemed that they had worked on everything, but the car's hand brake.

Meanwhile, Pete had borrowed a flashlight because it was now long after sundown. His light fell on the gage of the fuel tank under the car. It read empty. "Jim," stormed Pete, "did you drag me away from my bowling just to tell you this car was ho fuel on it?" Pete went on, expressing his displeasure in several other ways. This time he really had reasons for grumbling; and it is his favorite pastime. Big Jim was seething too, but he would talk to Tony and Mike later.

"Pete, is fuel oil all that it will take to get this deal cooking again?"

"Not cooking, Jim," replied Pete, "cooling! No, now it will take a little more than that. The whole fuel system will need priming. Apparently the engine died just before the car was switched in here and it did this because

(*Continued on Page 42*)




Trailer hitch in position, removing load from front piers. King pin support has already been elevated.

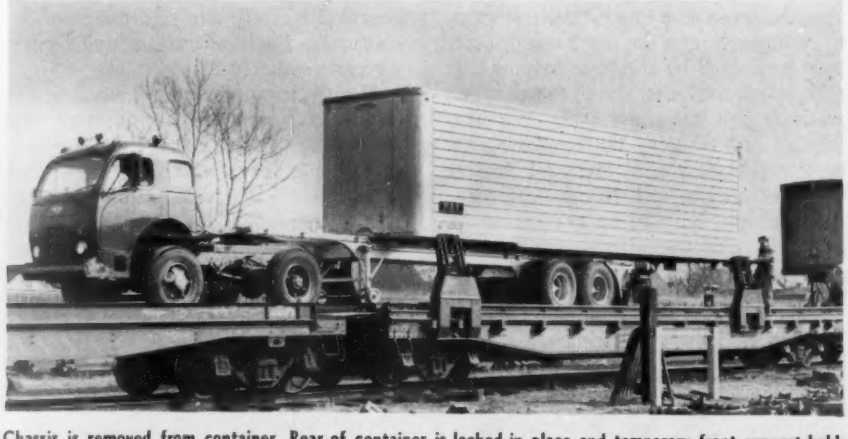
# Union Pacific Tests Pullman's PAT Piggyback

A PROTOTYPE of a piggyback container system, announced by Pullman Standard and Trailmobile four months ago, is being tested by the Union Pacific. Called PAT (*P*ullman *A*nd *T*railmobile), the system can use existing ramps, tractors and flat cars. The demountable containers can be handled by forklift or overhead crane. Car conversion was done by Pullman.

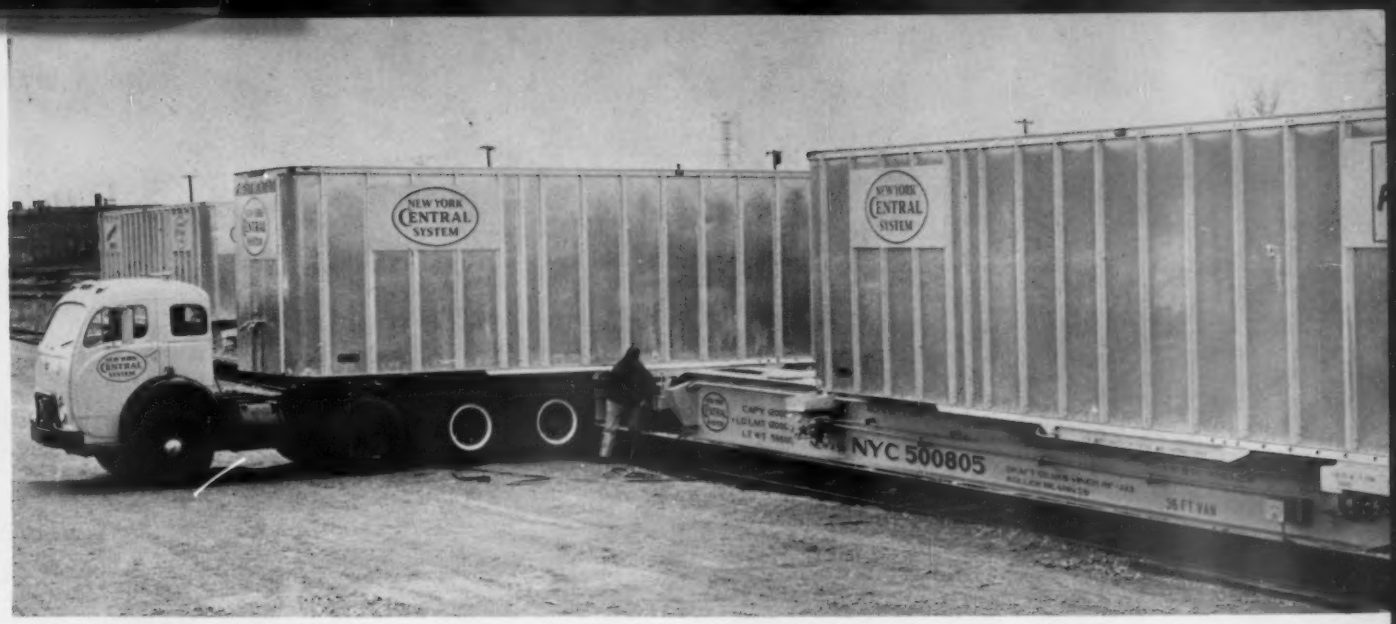
Trailmobile furnished two 35-ft chassis and one 35-ft container. A standard Union Pacific flat car was modified by adding guard rails, four support piers and a trailer hitch. The adjustable hinged pier supports can be moved outward for loading standard wheeled trailers and the PAT unit where the container is left on chassis.

In shipping the container only, the chassis-container unit is backed onto the car. As the rig is positioned, slide plates at rear corners of the container engage piers at the rear of the car. When container is spotted, the front support piers are positioned, temporarily holding the container in place. The two locking devices holding the container to the chassis at the rear are disengaged and the air is exhausted from the springs. The container lowers into final position, locked to the rear supports. Two similar locks at front of the container are freed, and chassis is pulled away by a tractor. The trailer hitch is raised engaging the king pin, lifting the front of the container off the front support plates. The car is then ready to roll.

By adding two support piers at center of car two smaller containers can be shipped.



Chassis is removed from container. Rear of container is locked in place and temporary front support holds container until trailer hitch is raised.




Turntable design enables delivering driver to load his own trailer and eliminates the consecutive circus-type loading of most conventional piggybacking.

# NYC Begins Flexi-Van Operations

NINE HUNDRED highway trailer bodies, 150 double-tandem wheel-and-axle assemblies, and 172 special railroad cars will be utilized by the New York Central in its recently inaugurated piggyback operation. When all delivered, this equipment will cost over $8,000,000.

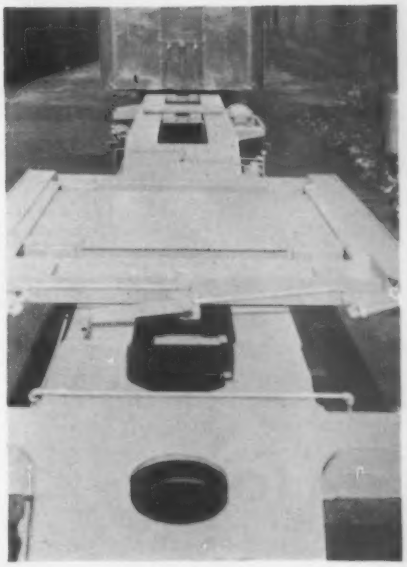
All of the equipment including the cars is being built by Strick Trailers. This new car builder has used components from many traditional railroad suppliers. The center sill of each car is composed of two 33-in., wide-flange, high-tensile beams. These beams are cut and formed to be depressed under the two turntables on the body. At each end, they are welded to special General Steel end castings.

The trailer bodies are cushioned on special Waugh cushion assemblies in the turntables. These tables each have hydraulic cylinders operating at 10,000 psi to develop a lift of 90,000 lb, although the cars are designed to carry only two 60,000 lb trailer bodies. Hydraulic pressure lifts the turntable from its locked rail-haul position so it can be swung by hand to a position at right angles with the car centerline for loading and unloading. The 12-volt hydraulic electrical system is fed from the battery of the unloading tractor.

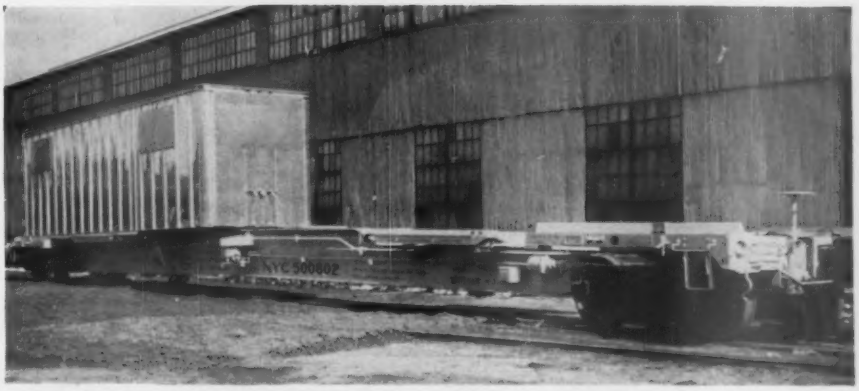
Overall length of each Flexi-Van rail car is 83-ft 3-in. between pulling faces. The car will transport a 40-ft (or shorter) trailer body at the A end, and a 36-ft container at the B end. Because of the length, the cars have separate body-mounted brake cylinders and automatic slack adjusters for each truck. The last 22 cars will be for passenger service with multiple-wear wheels, and signal and steam lines.

**Partial List of Suppliers**

| | |
|---|---|
| Truck side frames | American Steel Foundries |
| Bolsters | Symington-Gould Corp. |
| Springs | Alco Products, Inc. |
| | Crucible Steel Co. of America |
| Side bearings | A. Stucki Co. |
| Axles and wheels | Bethlehem Steel Co. |
| Roller bearings | Hyatt Bearings Div., GMC |
| | Timken Roller Bearing Co. |
| Brake beams | American Steel Foundries |
| | Buffalo Brake Beam Co. |
| Brake shoes | American Brake Shoe Co. |
| Brake forgings | Pittsburgh Forgings Co. |
| Brake-pipe fittings | Gustin-Bacon Mfg. Co. |
| | Westinghouse Air Brake Co. |
| Hand brake | National Brake Co. |
| Pneumatic slack adjusters | New York Air Brake Co. |
| Draft gears | Cardwell-Westinghouse Co. |
| | W. H. Miner, Inc. |
| Couplers | National Malleable & Steel Castings Co. |
| End Castings | General Steel Castings Corp. |
| WF beams and deck plates | Bethlehem Steel Co. |
| Turntable posts | General Steel Castings Corp. |
| Turntable shock absorbers | Waugh Equipment Co. |
| Hydraulic cylinders | Kalamazoo Div., N.Y.A.B. Co. |
| Hydraulic system | Blackhawk Manufacturing Co. |
| Receptacles | Joy Manufacturing Co. |



Trailer "side sills" slide in guides on these tables and the body is then locked in place.




Camber of 2¼-in. is built in these cars which have light weight of 60,000 lb. Car is heavy enough to balance a trailer with unsymmetrical load.

# What Next for Solid Bearings?

Examinations of used journal bearings show that improper weight distribution, uneven end wear, and bearing lining deformation are major reasons for bearing removals. Overcoming these deficiencies and providing a proper oil seal should improve performance of the solid journal bearing assembly.

There are numerous reasons for the lack of comprehensive data on hot box causes. The large number of journal-box assemblies in service, their low incidence of failure (based on 1956, set-outs occur once each 11.8 car-years), and the fact that failures frequently destroy all evidence all have a part in this.

In 1953 data submitted by fourteen AAR member roads indicated that waste and lint under bearings accounted for 53.77 per cent of all hot boxes. This added to other waste-pack deficiencies, accounted for a total of 77.16 per cent of all hot boxes. Mandatory use of lubricating devices in lieu of the waste pack should substantially reduce this.

An inspection made at a Magnus plant of 3,205 consecutive bearings turned in for scrap determined the pattern of load distribution. The bearings inspected had not been overheated, but the 32.7 per cent with excessively heavy loading at either end, or at both ends, were potential trouble makers.

The crowned journal-bearing wedge as the load distributing medium in the box can fail to function if worn flat, if bent and distorted, or if the box roof is worn concave.

Tests made in 1950 by the Santa Fe indicate a nominal full thickness wedge used with a standard 5 x 9-in. depressed-center-back bearing tends to distribute more than a proportionate share of the load on the ends of the bearing. As wedge thickness is decreased, the load on the center increases. Using a full thickness wedge and a flat-back bearing, the greatest load is on the center of the bearing. The load on the center of the bearing increases as the wedge thickness is decreased.

The cause of unfavorable load distribution indicated by 23 per cent of the Magnus-inspected bearings with heavy end loading is evident if an inspection is made of older cars in service. Large numbers of the cars now operating are so old that highly undesirable box roof conditions have developed. Few railroads are making repairs to correct this condition. Removable wear plates in the box roofs of integral side frames are now an AAR alternate standard. Many years must elapse before enough such side frames are in service to improve this situation. Other undesirable conditions on old cars causing improper weight distribution are loss of side-bearing clearance, loose body bolsters, and fouled center plates.

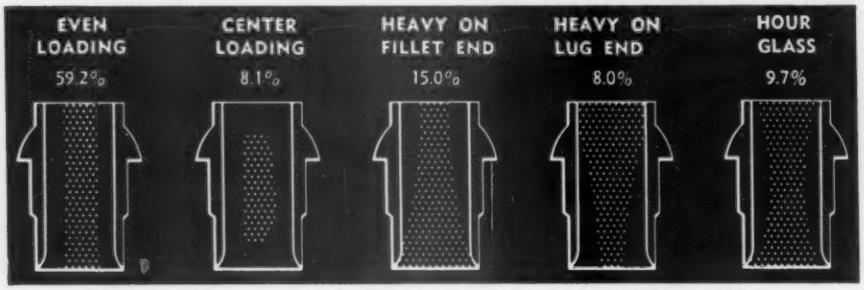
The obvious solution is more thorough truck overhaul in conjunction with heavy car repairs. At the same time, every step should be taken to insure the quality of journals produced by wheel shops.

### Spread Linings

Spread linings are recognized as a hot-box cause by AAR Interchange Rules which says that a bearing is condemnable whenever the lining is spread ⅛ in. or more below the bottom edge of the bearing. This is a common defect. Twenty one per cent of 1,274,328 bearings found in the scrap of 25 railroads showed this defect. Spread linings are caused by fore-and-aft movement due

(*Continued on Page 42*)

*An abstract of the paper "Available and Potential Developments in Design for Standard AAR Solid Bearing Assemblies," by M. A. Hanson, chief engineer, Magnus Metal Corp., presented at the ASME-AIEE Cleveland meeting on April 10.*




**Load distribution on over 3,000 bearings was determined by examining the wear patterns. Results of these examintaions showed that over half were uniformly loaded from end to end.**

## Distribution of Bearing End Wear on 10,000 Bearings

(Inspections of consecutive scrap bearings received at a Magnus plant)

| | Slight wear* | Moderate wear* | Heavy wear* | |
|---|---|---|---|---|
| Lug end only | 2,368 | 905 | 230 | 3,503 |
| Collar end only | 279 | 704 | 202 | 1,185 |
| Both ends: | | | | 4,119 |
| At lug end | 2,180 | 1,423 | 516 | |
| At collar end | 554 | 1,968 | 1,579 | |
| Total showing wear | | | | 8,807 |
| Number showing no end wear | | | | 1,193 |

*Slight wear is 1/16-in. or less, moderate wear is 1/16 to 3/16-in., and heavy wear is over 3/16-in.

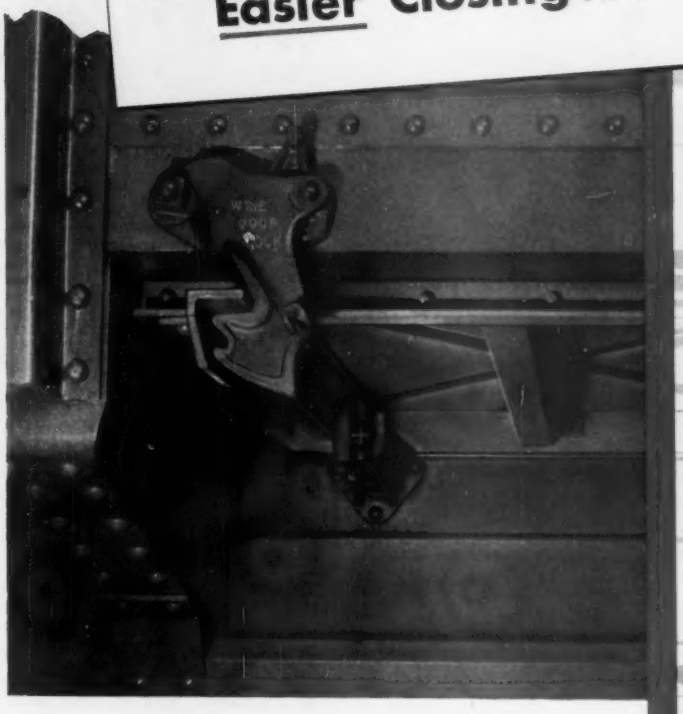
## How Wedge Thickness Affects Load Distribution

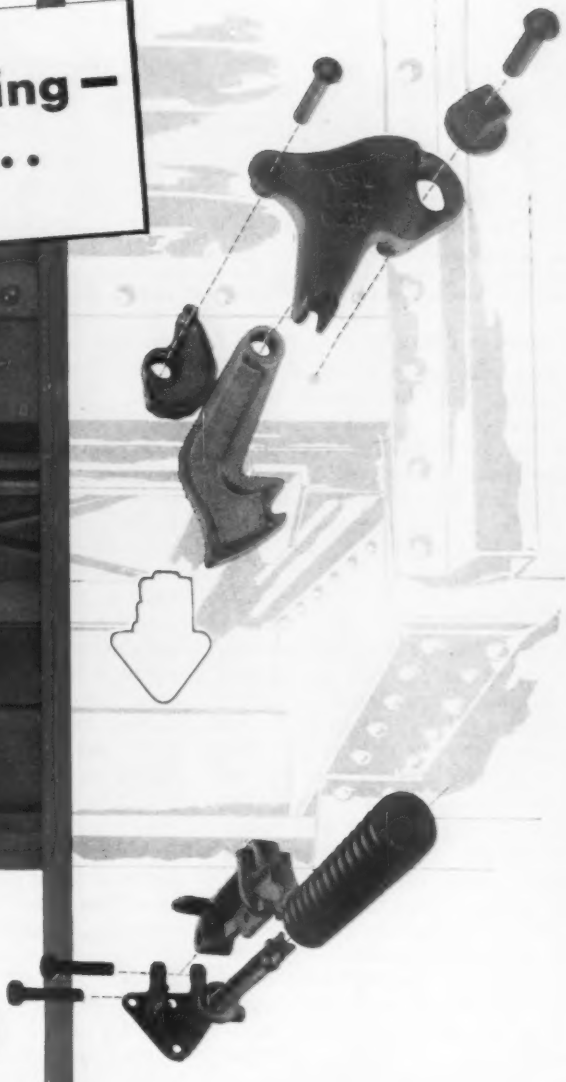
Results of tests conducted by the Santa Fe in 1950

**16,000-lb journal load on 5- x 9-in. wedges**

| | Wedge thickness, in. | Load on center, lb | Load on each end, lb |
|---|---|---|---|
| Crowned wedge (AAR standard) | 0.960 | 4,750 | 5,630 |
| " " " " | 0.906 | 5,120 | 5,450 |
| " " " " | 0.812 | 5,730 | 5,140 |
| " " " " | 0.760 | 6,220 | 4,880 |
| Flat back wedge | 0.950 | 5,600 | 5,200 |
| " " " | 0.900 | 5,940 | 5,025 |
| " " " | 0.850 | 6,320 | 4,850 |
| " " " | 0.800 | 6,725 | 4,625 |
| " " " | 0.750 | 7,150 | 4,400 |

**Controlled Unloading—**
**Easier Closing...**





WINE DROP DOOR

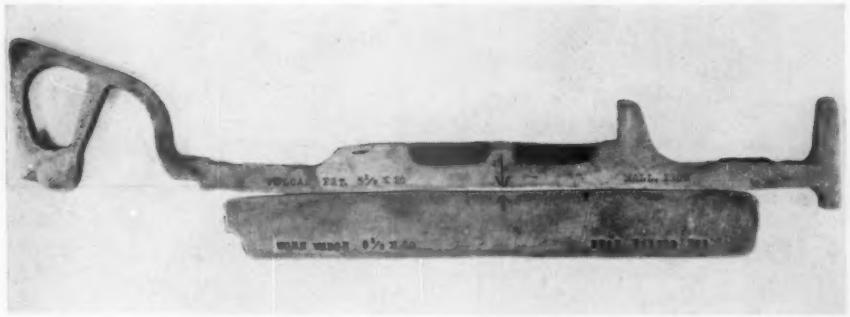
## Spring Hinges and Adjustable Locks

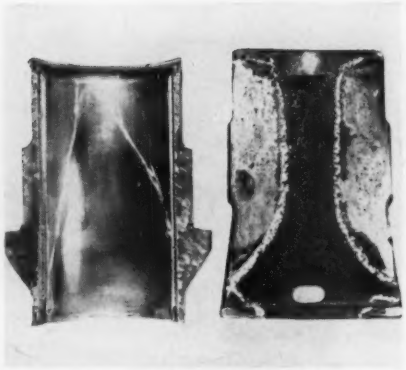
- DURABLE, CAST STEEL PARTS
- SIMPLIFIED DESIGN AND APPLICATION
- INDIVIDUAL, POSITIVE DOOR FIT
- MINIMUM SERVICE COSTS

For All Drop Door Gondolas...

WINE

THE WINE RAILWAY APPLIANCE COMPANY
TOLEDO 9, OHIO





Crowned journal bearing wedge (above) fails to distribute the load evenly when box roof is worn. Even new wedge will not operate properly. Pedestal boxes operating with worn liners and separable boxes with loose bolts tend to load the sides of wedge and produce uneven bearing wear (at right).

(*Continued from Page 40*)

to impacts and by the thrust of single shoe brakes. This fore-and-aft movement frequently is so great that the dry seat of the axle strikes the walls of the dust-guard well. Occasionally, an axle collar will foul against the box wall and wear a hole through the journal box. This type of damage can be eliminated by journal stops.

**Unequal Thrust**

To obtain data on the wear on each end of the bearing, 10,000 consecutive scrap bearings were inspected at a Magnus plant. This indicated that most of the heavy wear is occurring on the ¾-in. fillet end rather than at the wedge end. More desirable would be evenly distributed wear at both ends. The end of the bearing which receives the greater thrust can depend on the location of lugs, on bearing collar thickness, and on over-all length. A more inboard lug location increases thrust on the lug end; greater bearing collar thickness increases thrust on the ¾-in. fillet end. Wear of other journal-box components introduces additional variables.

Now under way, an AAR project to determine optimum bearing design will evaluate ¼-in. longer bearings with several lug locations. This is an attempt to equalize thrust loads and also to reduce journal-box assembly lateral.

**Oil Leakage**

Several problems are encountered in attempting to seal a journal-box assembly. The longitudinal movement of the journal must be restrained because no seal can be expected to perform with ¾ in. of fore-and-aft travel. Lateral will have to be restrained so the axle dry seat remains in contact with the rear seal; or, the seal should be designed to maintain such contact with present lateral. The present 5½- x 10-in. box assembly, with all parts worn to a maximum, can have as much as 2⅜ in. lateral. A reduction of oup to ½ in. in total lateral appears feasible by modifying journal-bearing dimensions.

A considerable number of rear seals are now undergoing field tests. Some have been found in fair condition after operating up to 140,000 miles in interchange freight service on cars fitted with journal stops. If fore-and-aft journal movement is controlled by journal stops and if lateral is held within reasonable limits, practical sealing of the rear box opening does not seem far off.

Under most service conditions, little oil is lost from the journal boxes at the lid (except at car dumpers), but experience has demonstrated that an effective rear seal requires the use of a lid seal. If the rear opening is sealed tightly, the journal begins to act as a pump piston during lateral movements. The partial vacuum which is created tends to bring in dirt and snow. Several reasonably effective lid seals are already available. With them, venting of boxes may be necessary. Vents can be provided cheaply.

**Summary**

To further improve the performance of the solid bearing assembly and reduce its servicing requirements, the following are indicated:

- Improve bearing load distribution with more thorough truck overhaul.
- Stabilize the journal-box assembly with journal stops.
- Equalize bearing end thrust and decrease lateral by modification of the bearing design.
- Reduce oil leakage by using rear and front seals.
- Maintain acceptable standards of journal finishing.

The total effect should be substantially improved performance. The overall cost of such a program would not be exorbitant and should be quickly recovered through operational savings.

---

**Pete's Average Goes Down**

(*Continued from Page 37*)

it ran out of fuel. That means that the fuel lines are full of air, and the pump won't pick up oil from the tank without priming."

"Pete," Big Jim broke in, "show these two guys how to do this priming and I'll run to the phone and get some fuel on the way over. I'll still get you to your bowling in time."

Pete reminded Jim that these small diesels would burn only No. 2 diesel oil and not the "economy" fuels the company was now using on its diesel road locomotives. He then showed Tony and Mike how to remove the pipe plugs from the tops of the two filter bowls to pour fuel directly into them. He went on to point out the fuel manifold through which oil is distributed to each of the injectors, and demonstrated how fuel should be poured directly into it. He warned that extreme care should be taken to insure that the plugs were replaced tightly so no further air could enter the fuel system. He added that it might be necessary to refill the filters a second time before the pump would pick up the fuel and let the engine run. By then Big Jim was back and ready to return Pete to the bowling alley.

Next morning Pete went into the office after being summoned by his boss. "Pete, you never cease to amaze me. What made you find that empty tank so quickly last night?" "Well," explained Pete, "a diesel engine needs four things to run—fuel, ignition, lubrication, and cooling. Lubrication or cooling failures won't prevent an engine from starting, but either one can keep it from continuing to run. Ignition is a matter of rotation combined with compression. We apparently had both last night. Fuel failure was the most logical place to start. No use checking the fuel pump, piping, filters and things like that until you know you have a fuel supply. I'm glad we got that car operating with no more trouble, but you fellows sure ruined my game. I only averaged 230."

Pete likes to complain!

## CLEANER, LONGER LASTING

Esso Diol RD crankcase oils meet the need of modern diesels for very effective and economical detergent lubricants that will provide maximum protection for sensitive engine parts.

Even after the most severe freight or passenger operation, engines using Diol RD are exceptionally clean. They show a minimum of carbon deposits in the piston ring zone . . . very little lacquer or varnish on piston skirts and exhaust valve stems. And Diol RD oils effectively prevent corrosion of the silver wrist pin bushings or alloy bearings.

The good oxidation stability of the base stock in Diol RD oils is bolstered by the detergent-inhibitor additive used. Result: greater mileage between oil changes, with consequent lower costs. For data or technical assistance call your local Esso office or contact: Esso Standard Oil Co., Railroad Sales Division, 15 W. 51st St., New York 19, N. Y. *perfected by research . . . proved in performance*

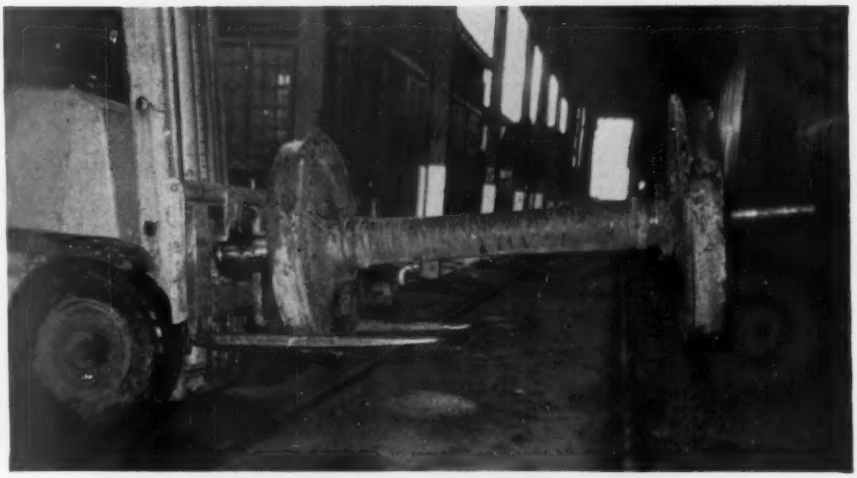
# DIOL® RD

ESSO
RAILROAD PRODUCTS

# CAR REPAIR TIME-SAVERS

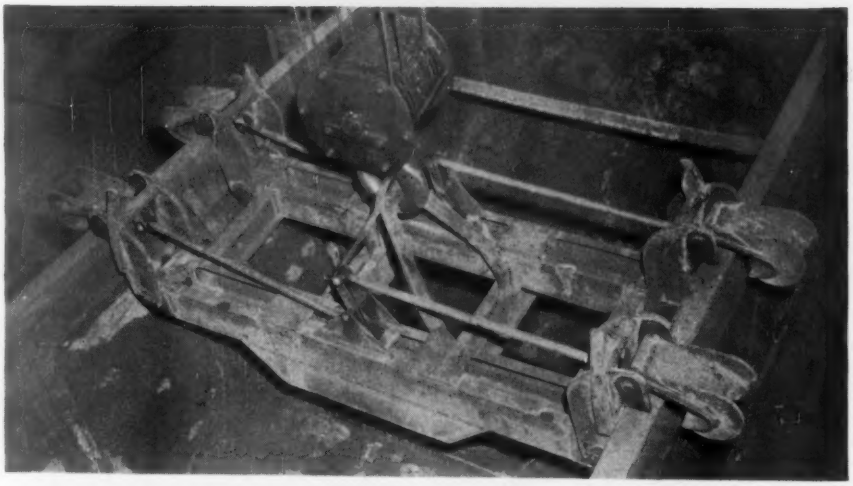
## Southern Pacific Wheel-Handling Fork Lift

Southern Pacific's Hyster fork lift at Brooklyn, Ore., shop was fitted with a retainer so that wheels can be moved and placed on tracks easily. Retainer is a 3-in. length of 6 by 11-in. journal brass brazed to two steel plates and welded into the truck's lifting frame so the axle end is held down while the wheels are being lifted. The journal collar comes against the brass and is not damaged. End handling of wheels simplified their movement into and out of restricted spaces.



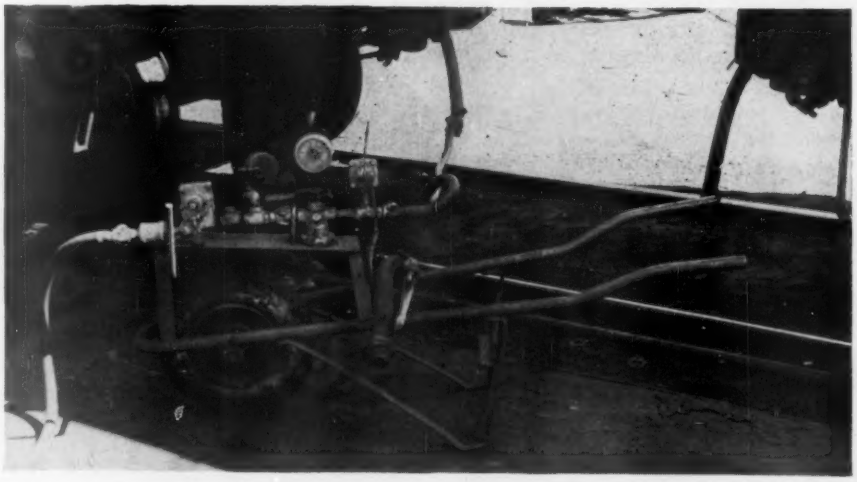
## Illinois Central Hopper Body Lifting Device

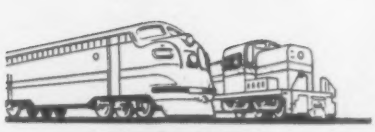
Lifting device consisting of four clamps with toggle-joint arrangement made it possible for Illinois Central to use a single overhead crane for handling car bodies during a repair program. Device was used for placing the bodies back on their trucks. This unit was developed by A. E. Jones, derrick engineer at the IC's Centralia, Ill., shop.



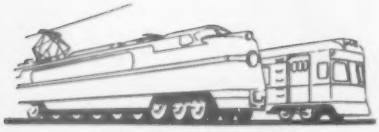
## Fruit Growers Express Single Car Tester

Single car air brake testing device is mounted on a wheel barrow frame at the Jacksonville, Fla., shop of the Fruit Growers Express. Frame has space for carrying extra hoses and tools. Longer hoses used during the brake tests can be coiled and carried on it when the tester is being moved to another car.





DIESELS



ELECTRICS

MU CARS

# ALL can have EXTRA, TROUBLE-FREE MILEAGE with Magnus traction motor support bearings

EVERY make and model of diesel-electric and electric locomotives or MU cars ever built can take advantage of the extra precision and trouble-free performance of genuine Magnus HIGH MILEAGE traction motor support bearings. These super-precision replacement bearings, designed and built by bearing specialists, can be obtained by any Railroad directly from Magnus Metal Corporation.

Each of the features at the right makes an important contribution to that extra safety factor found only in Magnus traction motor support bearings. And the present-day trend to higher mileage between motor overhauls call for this added cushion against costly breakdowns.

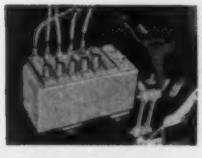
What's more, Magnus high-speed, high-precision production methods can manufacture these bearings so economically that relining or rebuilding is both unnecessary and impractical.

For the complete story on Magnus HIGH-MILEAGE traction motor support bearings, write for your free copy of Bulletin No. 6000, Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 4, Ill.

**FEATURES**

1. Perfectly mated bearing halves
2. Heat-resistant Satco lining metal
3. Interchangeable double keeway
4. High strength brass backs
5. Improved flange fillet profile — no "feathering," no "riding."
6. Precision finish boring to extremely close tolerances.

*OTHER MAGNUS PRODUCTS FOR DIESEL LOCOMOTIVES*



Wheel Flange Lubricators

Safety Valves

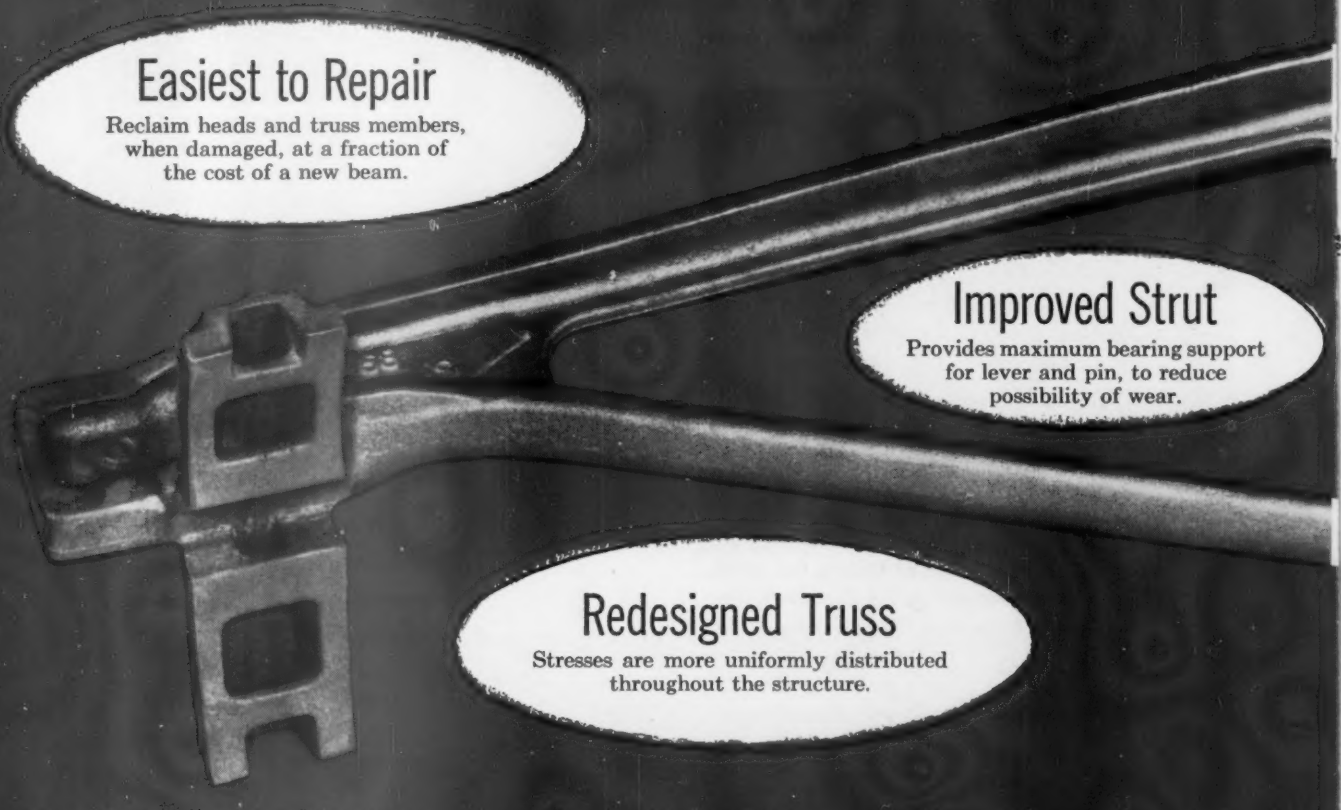
Fuel Tank Sight Gages

MAGNUS High Mileage

**MAGNUS METAL CORPORATION** *Subsidiary of* **NATIONAL LEAD COMPANY**

*New and better...*

# 1958 ASF No. 18



**Easiest to Repair**
Reclaim heads and truss members, when damaged, at a fraction of the cost of a new beam.

**Improved Strut**
Provides maximum bearing support for lever and pin, to reduce possibility of wear.

**Redesigned Truss**
Stresses are more uniformly distributed throughout the structure.

*For HIGHER safety margins...*
*at LOWER operating costs...specify .....*

# Cast-Steel Unit Beam

Here's a brake beam that reflects the very latest in testing and steel-casting techniques—plus ASF's twelve years of service experience with this type of beam. Like its predecessor, this new beam is built to stay on the car and out of the scrap pile . . . except that the new design will give you even *better* performance.

ASF

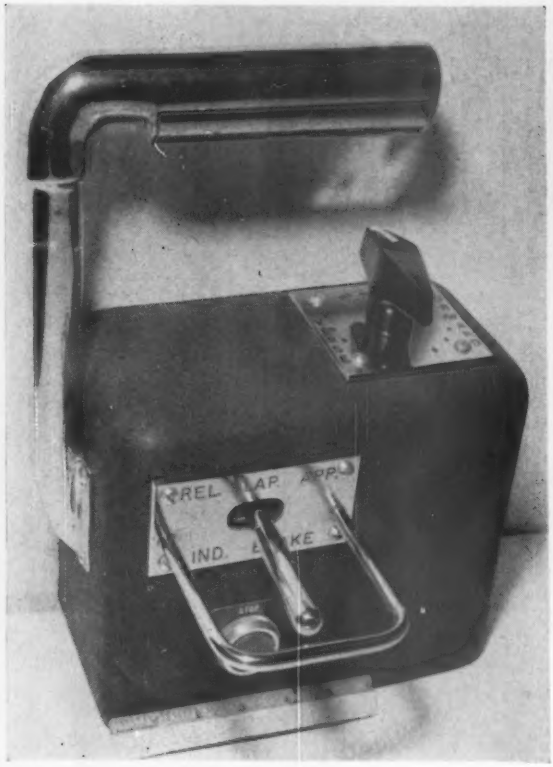
**CAST-STEEL UNIT BRAKE BEAMS**

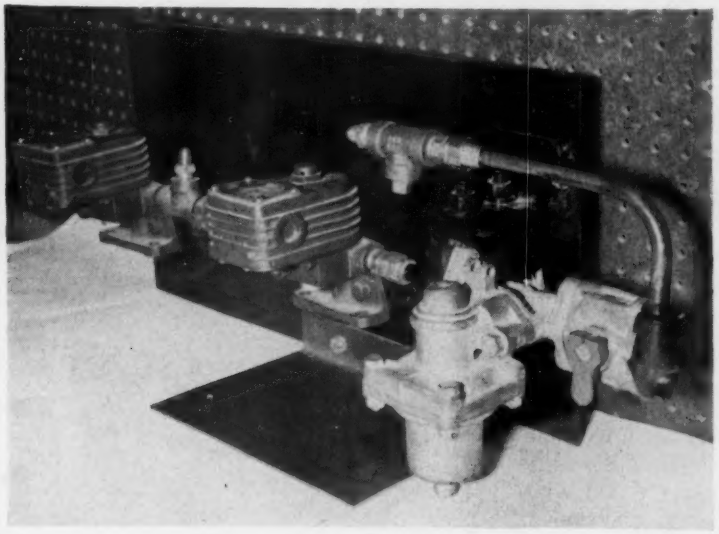
**AMERICAN STEEL FOUNDRIES**

**Prudential Plaza, Chicago 1, Illinois**

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec
Other Foreign Sales: American Steel Foundries, International, S. A., Chicago.

GEARED TO PROGRESS
P R I
MEMBER



Above: Equipment to be mounted on the locomotive, as part of the portable control station, consists of a reducing valve, two solenoid valves and a check valve for control of the locomotive brake and another solenoid valve to work in conjunction with the "dead man" control.

At left: Portable control station, developed by General Motors Diesel, has 14-conductor receptacle in base from which control cable runs to locomotive control stand.

# Portable Controller for Locomotives

**Developed for Canadian Pacific, this unit makes possible complete control from any cab location**

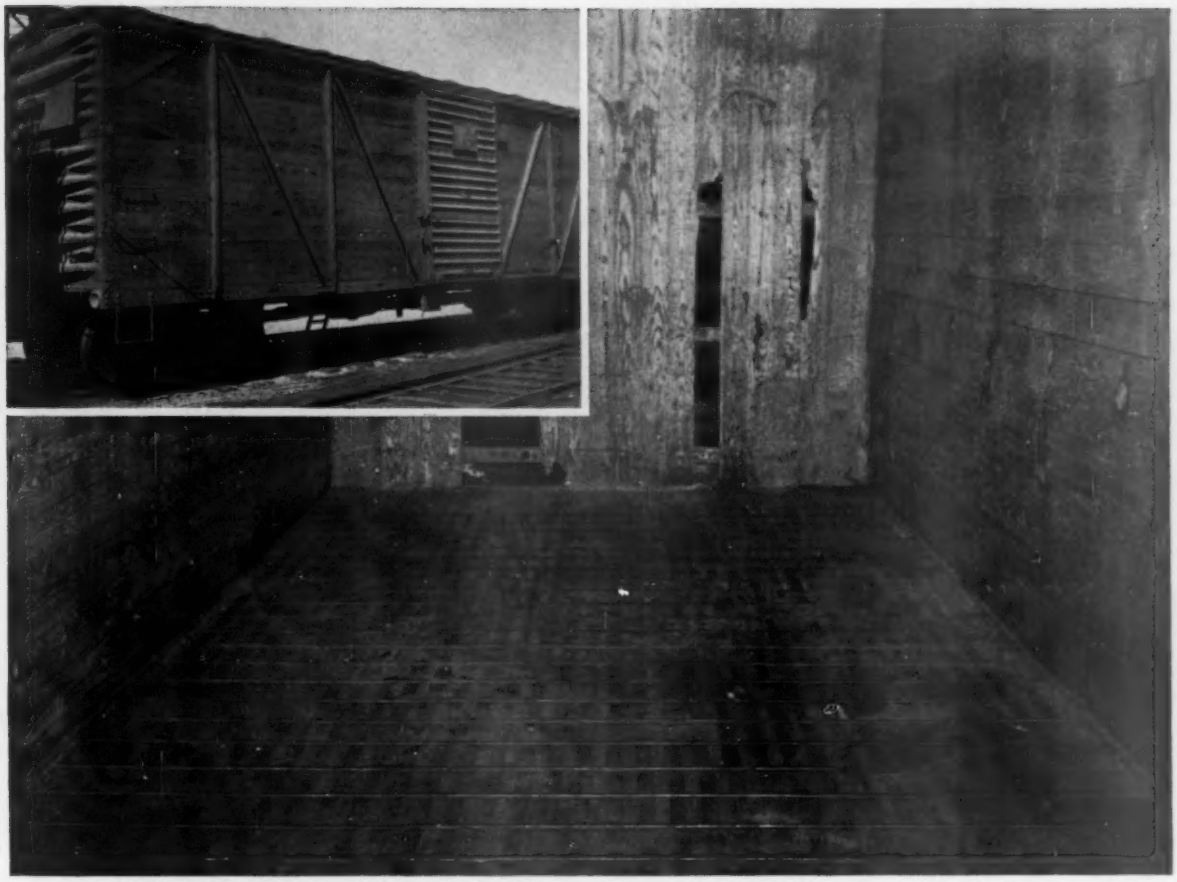
A PORTABLE CONTROL STATION permitting the operation of diesel-electric locomotives from any location in the cab has been developed by General Motors Diesel, London, Ont. Its operation was demonstrated during Royal Commission hearings on the elimination of Canadian Pacific firemen.

Measuring 5 by 8 by 9 in. and weighing 14 lb, the portable control box is equipped with a combination throttle and reverser handle, a brake lever, an emergency stop pushbutton, and a combination deadman control and carrying handle. A 14-conductor flexible cable plugs into a receptacle on the bottom of the control box and to the locomotive control stand.

The combination throttle and reverser handle makes it impossible for the operator to change from forward to reverse unless the throttle is at idle position, and an interlocking mechanism prevents changing from forward to reverse without stopping the handle at idle.

As long as the portable control box is carried or held by the handle, the "dead man" safety control is paralleled with the existing locomotive safety control foot pedal and is in a safe position. The brake handle applies and releases the locomotive brakes by electrically controlling the solenoid valves which initiate the supply or exhaust of air to the brake cylinders at a controlled rate. Thus, the length of time that the handle is held in either the apply or release position determines the amount of pressure in the cylinders. A fail safe circuit is employed to apply the brakes when the circuit is interrupted.

When the portable control box is not in use, a bracket on the regular engineer's control stand is provided for storage. A similar control device for locomotives with pneumatic throttle has been developed.



*Unretouched photograph of 28-year-old boxcar interior in shop for interior repairs.* N-S-F *in Class A condition.*

# N-S-F® STILL IN CLASS A CONDITION AFTER 9 RUGGED YEARS

PATENTED
NAILABLE STEEL FLOORING is made of low-alloy N-A-X HIGH-TENSILE steel—remarkably strong, corrosion resistant—formed into channels, and welded together to form a unique nailing groove. Nail is clinched in a tight grip of steel, yet can be readily removed.

Back in July, 1949, a midwestern railroad installed NAILABLE STEEL FLOORING in one of its boxcars, then a veteran of 19 years on the line. After nine years spent in hauling grain, paper, plaster board, carbon black and countless other items, the floor is still in Class A condition and almost as good as new. What makes this record more important is that the car has no stringers and only one pair of cross ties at each end. N-S-F in 2⅜" 10-gage spans the floor from side sills to center sill.

Obviously, N-S-F adds a lot of strength to critical points in the underframe. It stands up under the heavy impact of lift truck loading. It may even outwear the car itself. Full information and cost studies on the use of N-S-F in freight cars is readily available from Stran-Steel representatives in Chicago, New York, Philadelphia, St. Louis, Cleveland, San Francisco, Minneapolis and Atlanta. In Canada, N-S-F is made and sold by International Equipment Co., Ltd., Montreal.

*Over 60,000 cars have been equipped with* N-S-F.

NAILABLE STEEL FLOORING
Originated and sold by—
**STRAN-STEEL CORPORATION**
Dept. L-20 • Detroit 29, Michigan • Division of
NATIONAL STEEL CORPORATION

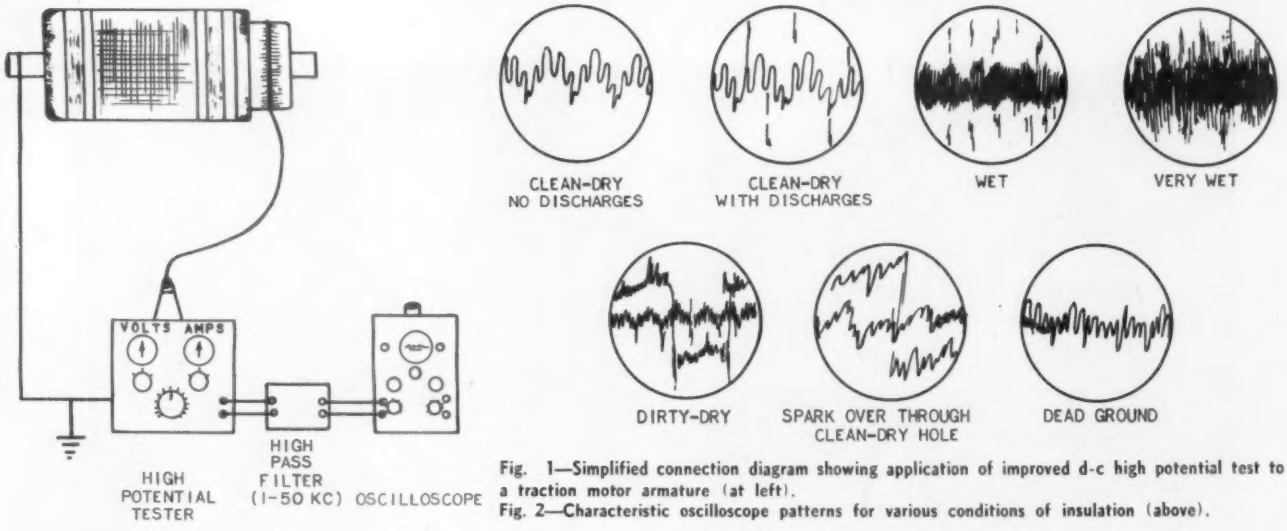



**Fig. 1—Simplified connection diagram showing application of improved d-c high potential test to a traction motor armature (at left).**
**Fig. 2—Characteristic oscilloscope patterns for various conditions of insulation (above).**

# D-C High-Potential Testing Has Been Improved

DURING THE PAST SEVERAL YEARS, d-c high-potential testing has gained considerable acceptance in railroad shops. An improved method (*Railway Locomotive and Cars, March 1958, p. 46*), promises to enhance the usefulness of this type of test. To appreciate its significance, let us first review present methods of insulation testing.

### Two Present Methods

The a-c high-potential test is of the "go-or-no-go" type. The insulation either stands the test or breaks down. If it passes, the margin by which it passed is not known. If it fails, a portion is completely ruined and must be replaced. This is a crude device at best, since it gives no actual measurements of the insulation quality other than its ultimate strength at the end of the test.

An improvement is made when d-c megohmmeter tests are used in addition to the a-c high-potential test. Insulation resistance measurements can then be made, and useful data obtained. Safe limits of minimum insulation resistance can be determined for specific pieces of equipment. If resistance falls below this value, the machine can be cleaned and baked, and the resistance measured again. If it is still too low, a step-by-step check must be used to locate the trouble. Then suitable action can be taken for repairing the machine.

This article is written by V. N. Wheaton, Locomotive and Car Equipment Department General Electric Company, Erie, Pa.

While the megohmmeter gives a value of insulation resistance, neither the corresponding voltage nor the shape of the resistance-versus-voltage curve for the insulation are known. Recent discoveries have shown that both this curve and the leakage current-versus-voltage curve tell much about the insulation condition as regards moisture and dirt. Therefore, although both the d-c megohmmeter and a-c high potential tests are used, they furnish only a small part of the information needed to diagnose the insulation condition.

With the improved method of d-c high-potential testing mentioned above, an oscilloscope is used to indicate electrical discharges in the insulation before it breaks down, thus giving three means for judging insulation condition—oscilloscope pattern, leakage current characteristic, and absorption current characteristic. Hence, more accurate and complete information is obtained, and the danger of harming the insulation minimized.

### Test Equipment and Procedure

The equipment consists primarily of an adjustable high-voltage d-c source instrumented to read test voltage and leakage current, and a cathode ray oscilloscope with a high-pass filter in its input. The oscilloscope is connected to show only the high-frequency discharges in the leakage-current measuring circuit.

Because of the low current capacity required for d-c testing, the equipment is quite small and light compared to a-c high-potential test sets, and the cost is correspondingly low.

The connections for testing (Fig. 1) are simple. A high-voltage lead from the instrument is attached to the machine terminals, brush holder or commutator. The shaft or frame is grounded to a common point with the instrument, and the leakage current is measured in the return circuit inside the instrument. The input to the high-pass filter is connected across the current-measuring circuit in the instrument, and its output is connected to the vertical sweep on the oscilloscope.

Before the high-voltage source is turned on, the milliammeter is set to minimum sensitivity, and the oscilloscope controls are set at predetermined markings. With the voltage adjustment turned down all the way, the switch is closed. If the oscilloscope shows no discharge, and no excessive leakage currents are indicated, the voltage can be raised to a readable value. The milliammeter is then adjusted to the proper range setting.

Now the voltage is slowly raised to the value for the first 1-min. reading, watching the oscilloscope for evidence of discharge to prevent overstressing the insulation. Voltage steps are then taken at 1-min. intervals. These might be 200-volt steps if the desired maximum is 1,000 volts. Leakage current and voltage after one minute are recorded for each step, and the oscilloscope

(*Continued on Page 52*)

# Five Hundred *for the Virginian*

These new triple-hopper cars are part of the 500 built for the Virginian at Bethlehem's Johnstown, Pa., shops. Designed primarily for coal haulage, they will stand up under many years of hard service.

Nominal capacity of the cars is 70 tons. Bodies are of combination welded-and-riveted construction. To insure longer life, all plates in contact with the lading are corrosion-resistant steel. Running gear includes one-wear wrought-steel wheels and forged-steel axles.

**Other major details include the following:**

| | |
|---|---|
| Length over coupler faces | 43 ft 6 in. |
| Length inside | 40 ft 0 in. |
| Width over bulbs | 10 ft 6⅛ in. |
| Width inside | 9 ft 9 in. |
| Height, rail to top of side | 10 ft 8⅛ in. |
| Truck centers | 31 ft 0 in. |
| Cubic capacity, level | 2573 cu ft |
| Light weight | 54,200 lb |

Perhaps your own needs may call for a different type or size of car. Whatever your requirements, we are equipped to meet them in full. Give us your specifications—or, if you prefer, our engineers will be glad to design the car. In either event, the Bethlehem shops will follow through promptly with a first-class production job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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**BETHLEHEM STEEL**

BETHLEHEM STEEL

screen watched for signs of discharges. Suppose these appear at about 75 per cent of the desired test voltage, this means trouble. One way to diagnose the trouble is to study the discharge pattern. This will show different conditions of insulation; (see Fig. 2). By proper use of this information the cause of the trouble may be determined. Moreover, observation of increasing discharges will give a warning so that the test can be stopped before reaching voltages that would damage the insulation.

The current and voltage values obtained above can be used to plot a leakage current characteristic. Various characteristic shapes of such curves are shown in Fig. 3. The test curve from a given machine is of value only when compared to a standard set of curves for that particular machine or set of machines.

If additional information, or a confirmation of results is desired, the dielectric absorption test can be made. This will be of special value during the introductory period of this test. Before starting the absorption test, the stored charges in the insulation should first be drained off by grounding the conductors under test for several minutes. The ground is then removed and the voltage quickly raised to a safe value established by the previous test. With the voltage held constant, current readings are taken at 1-min. intervals, beginning at the end of the first minute and extending for a period of 10 min.

In all but wet insulations, the leakage current will decrease over the 10 min period. The dryer and cleaner the insulation the higher will be the ratio of the 1-min to the 10-min current reading. This will range from 2.5 to 4, or higher. If the insulation is very wet the ratio will be unity for all voltages; see Fig. 4.

Temperature also has a marked effect on the leakage current characteristic. If the machine is hot the leakage current will be much higher than if the windings are at room temperature. To avoid errors from temperature change in the windings, readings should be taken with the insulation at or as near to room temperature as possible.

### Use in Shops

The use of this improved d-c test method in the running maintenance shop will be considered first. Here the ability to distinguish between wet and dirty insulation places it well ahead of the time-honored megohmmeter and a-c high-potential method.

The leakage current test is made first, observing the oscilloscope as already described. This may be followed by the absorption current test. The results of these two tests will show whether the insulation is wet or dirty. If wet, it can sometimes be dried out by running the engine and blowers. The leakage current test can then be repeated to see if passing warm shop air through the machines has effected any improvement.

Remember that the condition of creepage surfaces, such as brush-holder insulators, string bands and end windings is very important to these tests. Probably no test method can tell whether the water or dirt is on accessible creepage surfaces or on creepage surfaces in inaccessible locations. Therefore, if the leakage current test shows low insulation resistance, all accessible creepage surfaces should be cleaned and dried before attempting to proceed further. After this has been done, the condition of the conductor insulation can be analyzed in the manner already described.

A different situation exists in the back shop. Here it is not a question of whether equipment should be pulled out of service, but of whether it should be completely rebuilt or simply put into good running condition until rebuilding is necessary. Over the years a logical procedure has been built up that is genearlly followed. Before removing the armature the machine is given an insulation resistance test for grounds or very low resistance spots. After removing the armature the entire machine is thoroughly cleaned and baked dry. It is then given another d-c insulation test and, if satisfactory, an a-c high-potential test. If it passes, it is usually dipped in varnish and baked again. Another high-potential test is then given and the machine is ready for service.

A step-by-step examination of this procedure will show where the improved d-c high-potential test method may be used to advantage. If the megohmmeter shows low resistance in the first check; the d-c test will show the same, and also indicate whether the trouble is water or a possible combination of dirt and weak insulation. If water is indicated, cleaning and baking are in order, followed by another d-c high-potential test. This time an even better picture of the insulation condition is obtained because the effects of water and dirt have been eliminated.

If cleaning and baking do not raise the resistance enough, the insulation is presumed to be bad. It must then be stripped out. On the other hand, if the test shows that the insulation is usable, the machine can be dipped and baked. After cooling, it is given another d-c high-potential test and the results recorded for future use. By comparing these records whenever the machine comes in again, and observing their general trends, potential trouble undetected by individual tests may be spotted.

Mention has been made of plotting curves. While a railroad shop is obviously not a laboratory, these curves should be obtained if at all possible—especially at the outset of a testing program. Perhaps the engineering office

(*Continued on page 54*)

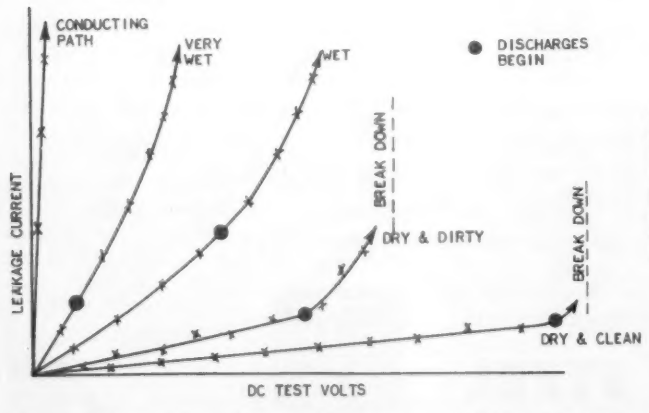


Fig. 3—Leakage current characteristics for various conditions of insulation.

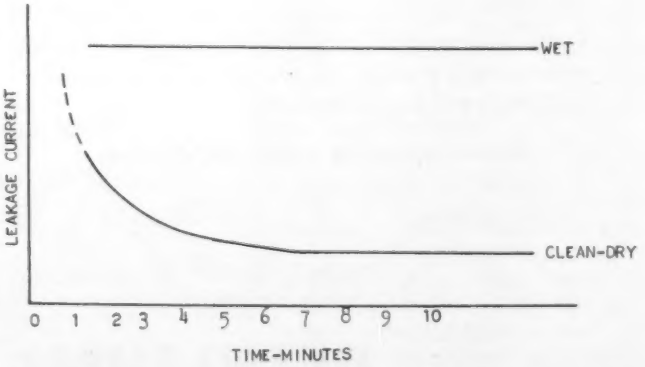


Fig. 4—Dielectric absorption characteristics for clean-dry and thorougly wet insulation.

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following the program can later set up a simple procedure with forms that will give the desired information and yet require a minimum of time and special instruction to use. After enough experience has been gained to assure proper understanding of the results, the procedure can probably be simplified, particularly in the matter of curve plotting.

However, the fact should be kept in mind that the inherent advantage of d-c high-potential testing is that it furnishes different types of data on the insulation system. Each type contributes its share to the final diagnosis of the insulation condition. If the tests are simplified too much, all or most of this superiority will be lost.

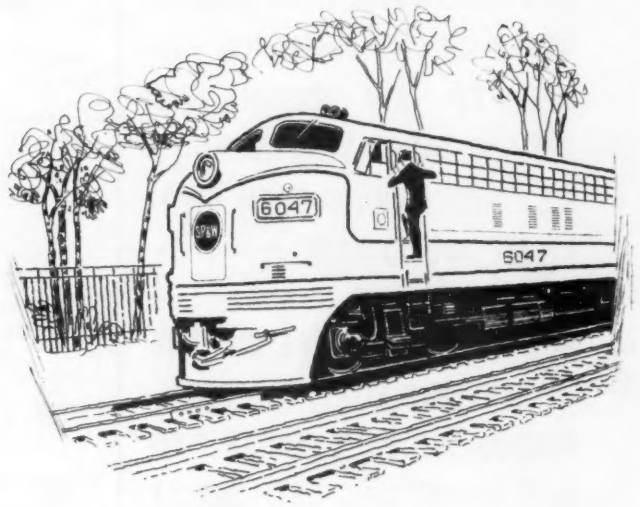
**Future Possibilities**

While d-c high-potential testing techniques are not yet perfected, it is recognized by both the ICC and AAR as a permissible substitute for a-c in standard over-potential tests. A great amount of study remains to be made; but this improved method appears to be a more complete tool for diagnosing insulation condition than any previously available. It will not eliminate the need for sound judgment; neither will it have any revolutionary effect on railroad procedures; but it may well prove to be a big factor in reducing road failures. The railroads themselves are in the best position to develop and apply this testing method to their own equipment. Help, as needed, can be obtained from various sources, including their own research groups and the manufacturers of traction equipment.

## From the Diesel Maintainer's Note Book

# *The Diesel Seemed to Be Starved for Fuel*

**By Gordon Taylor**




The road foreman was about to wind up a busy day by riding a two-unit passenger diesel to his home terminal. As he approached the locomotive standing in the station, he heard an engine that seemed to be slowing down and running at irregular speeds.

He hurriedly boarded the unit, thinking that something had caused the *PC* switch to trip and stop the fuel pump. He found that the *PC* switch was okay, and that the fuel pump was running. A glance at the five-lb fuel sight glass convinced hi mthat lack of fuel was not causing the trouble. Yet one of the engines was running slowly in an irregular manner and was noisy in its operation.

Being unable to locate the cause of trouble, and thinking there were some bad valves in the engine, the foreman very properly shut the engine down. Since no other unit was available, the locomotive was dispatched with one engine shut down. Fortunately, the train could be handled by two units, with only three engines working.

Arrangement was made to cut in a relief unit at a distant terminal so that the engine trouble could be located and repaired.

When the failed unit arrived at the repair point, the engine was cold, having been shut down about 14 hours, so there was nothing that could be done immediately except to make a careful inspection by barring the engine over by hand, and making blow-by tests to see if there were any bad valves, etc.

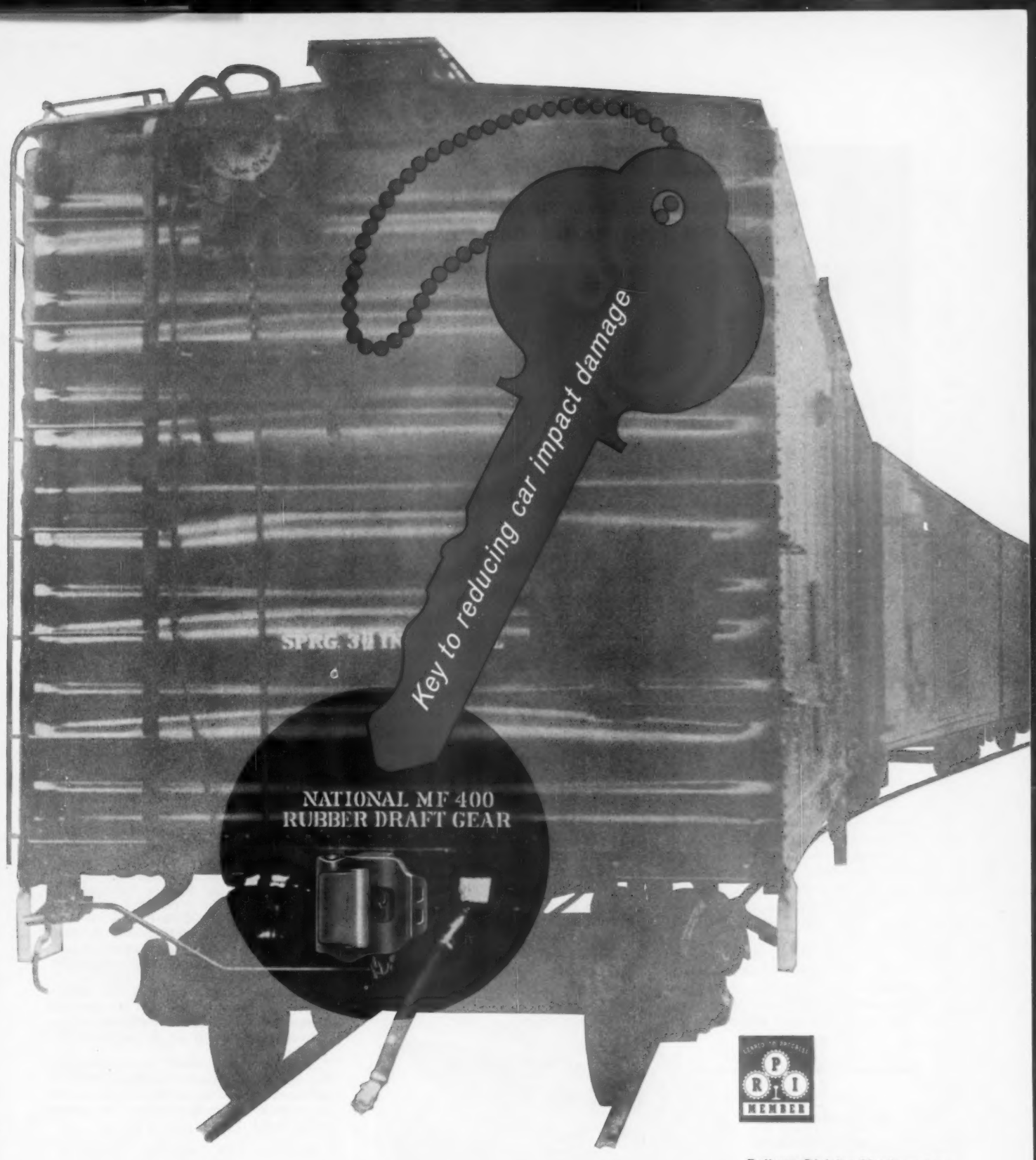
In making visual inspection, the diesel supervisor noticed that the overspeed trip reset lever indicated that it had tripped about half-way. Instead of the reset lever being inclined at an angle, it pointed in a vertical position, which showed that the trip shaft cams had not been able to completely lift the injector rocker arm rollers from the cam shaft. In the condition described, the overspeed trip could not completely prevent fuel injection and stop the engine.

As a result of the half-tripped position, the engine was receiving a limited amount of fuel, which explained the reason that the road foreman thought it must be starving for fuel. This also explained the unusual sound of the engine.

The cause of the semi-tripped condition of overspeed trip was apparently due to two things: First—one of the injector rocker arm pawls (one is located at the top of each cylinder, under the deck cover) had its latch bent so that it could not be properly set; second—the large coil spring that actuates the overspeed trip mechanism had become weakened to the extent that it did not exert enough pressure to throw the trip shaft throuhg its full travel. When these parts were replaced everything was okay.

From this it would appear that if an engine seems to be starving for fuel and the fuel pump is operating with fuel in the sight glass, it is necessary to get back in business.

*This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.*

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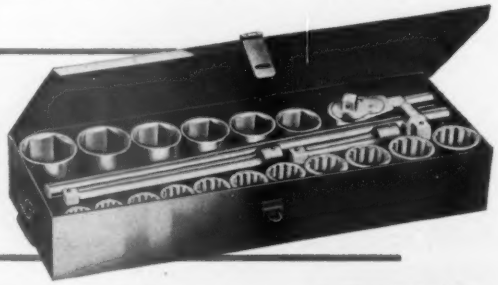

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## Shipper Group Suggestions May Affect Car Designs

Advantages and standardization of cargo containers or demountable trailer bodies for handling dry and refrigerated cargo are covered in a report issued following a six-months study by a joint industry and carrier group. The New York Central and Union Pacific have just received piggyback equipment which involves demountable trailer bodies (pages 38 and 39, this issue).

At the same time a spokesman for the gypsum industry has given details of the flat cars which have been found to handle gypsum products to best advantage.

Recommendations of the joint group for cargo containers include the following: Standard width—96 in.; standard height—96 to 102 in.; lengths—10 ft, 11 ft 6 in., 17 ft, 24 ft, and 35 ft. The containers should be capable of being handled on and transferred between highway, water and rail carriers. They should be designed to be stacked two high.

Securement should involve two-point tie down, automatic locking and unlocking at the shipping position, locking mechanisms capable of withstanding 7G horizontal and vertical accelerations, and locking device designs which can be applied to existing equipment.

The study group was composed of representatives of Minnesota Mining & Manufacturing, Clark Equipment, Reynolds Metals, Electro-Motive Division, Spector-Midstates Freight System, Browning Steamship, Slick Airways, Rail-Trailer Co., and the Rock Island. This group was impressed by the almost universal interest shown in shipping containers.

The participating companies will continue their efforts and work in developing a standard shipping container which can be advantageously handled by all different types of transportation systems.

### Bulkhead Flat Car Specifications

The Gypsum Association Traffic Committee's objective was to determine the ideal flat car based on field experience with more than 700 special cars now in use.

The recommendations include (1) cars with 48-ft 6-in. spacing between bulkheads, (2) protective bulkheads at each end of car with a minimum height of 78-in., (3) car floor and bulkhead width of 10 ft with the bulkheads wood faced with a minimum of 2-in. material and with all fastenings countersunk, (4) wood flooring capable of supporting 15,000 lb lift trucks, (5) fixed anchor devices recessed in the car floor, and (6) a special compartment behind one bulkhead with a capacity of 60 to 70 cu ft and reasonably weatherproof.

Shipments of wallboard on well-designed flat cars with bulkheads average 80,000 lb per car compared to 50,000 lb per car when the material moves in box cars, the gypsum group stated.

## Train Brake Act Passes

First railroad legislation enacted by the present session of Congress and signed by the President is the controversial train brake act. Opposed by railroads and recommended by the ICC, this law gives the commission power to prescribe rules for inspection, testing and maintenance of train brakes. The Commission first made this recommendation in its 1956 Annual Report.

121-S

# PROBLEM PAGE

## *SHOULD FLASHED MOTORS BE REMOVED?*

**Should the extent of a traction motor flashover determine whether it is cleaned up in place under the locomotive, or should the motor always be removed? If the practice of cleaning in place is used, what is looked for to determine if this will be done, and how can the locomotive be moved to rotate the armature and permit inspection and cleaning of the entire commutator?**

ENGINE SPOTTER DOES A JOB, *by W. A. Kresge, general superintendent, Pittsburgh & West Virginia, Pittsburgh.* We do clean up the flashed motor in place if, upon inspection, the flash is not too severe. The electrician holds the stone in place and locomotive is moved so that the flashed section can be cleaned of beading, etc. We use the Whiting engine spotter for this work. Its length of travel is more than sufficient for one revolution of the motor and it does an admirable job; not too fast and actually not too slow either. It must be borne in mind that a flash-over which can be repaired in this manner has not been too severe, but perhaps 30 or 40 per cent of all flash-overs fall in this category. After the flash-over has been cleaned up in this manner we paint the necessary portion of the motor with Glyptal, also using the Whiting engine spotter to move the locomotive. [*The P&WV uses a Whiting engine spotter originally purchased for setting its steam locomotive valves.—Editor.*]

ROTATING WITH A WELDING MACHINE *by Supervisor, Western railroad.* Sometimes traction motors are cleaned up in place under the locomotive and continued in service. This is done by stoning the commutator, cleaning the brush holders and applying new brushes.

The amount of work which can be done "in place" depends upon the extent of the damage from the flash. When the motors are cleaned up in place, it is our practice to rotate them by using current from an electric welding machine. The axle involved is raised so that wheels clear the rail, or the locomotive is moved to a section of track which has gaps cut out of the rail heads so that the motor can rotate the axle freely.

NOT OUT EVERY TIME *by L. E. Legg, Electrical Engineer—Equipment, Chicago & North Western, Chicago.* A traction motor should not be removed from a locomotive because it has had a flashover.

Nearly every traction motor shows some signs of flashover any time it is opened for inspection. Unless the flashover has been intense and has done a great deal of physical damage, a motor can usually be cleaned up and returned to service with a small amount of labor. Usually a flashover leaves a burr around the edge of the commutator and this can be dressed off with a file and sandpaper. The string band is usually found to be smoked up and this can be cleaned with alcohol. Brush holders can be cleaned this way.

The string band always should be inspected carefully after a flashover. Any damage to it can, in most cases, be repaired by painting with a heavy coat of Glyptal.

The complete circumference of the commutator is accessible by removing all the covers. However, if it is more convenient for the electrician to work on it from a certain location, the armature can, of course, be turned by moving the locomotive either under its own power or with another locomotive.

---

## *MOISTURE IN COMPRESSED AIR SYSTEMS*

**What can be done to eliminate the moisture contained in the compressed air delivered to the bell ringers and sand traps of diesel locomotives, or what can be done to prevent failures of these devices that are caused by this moisture?**

MOUNT THE BELL HIGH *by V. L. Smith, Superintendent of Motive Power, Belt Railway of Chicago.* The practice on this Railway which operates under the weather conditions which prevail in the Chicago area, is as follows:

1. We have equipped nearly all locomotives with automatic air reservoir drain valves which operate each time air compressor loads or unloads. This device has proven very successful. Air reservoirs are also drained manually each day when the locomotive arrives at its inspection point.
2. We have mounted the bells high up on the locomotive hood, and while this places the bell in an exposed location, it has the advantage of making it so that moisture cannot drain downwards to the bell as it did when the bell was located below the frame.
3. We have received improved performance in the cartridge-type bell ringer mechanisms by using the special bell-ringer grease recommended by the manufacturer.
4. We have had no trouble whatsoever with freezing of air at sand traps. We do have plugging of sand pipes adjacent to the rail caused by moisture or snow thrown up by the wheels.

Belt Railway of Chicago hangs bell high on hood of this GP unit.

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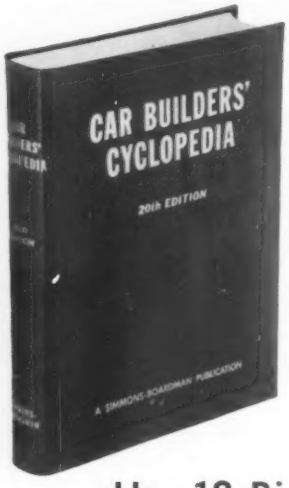


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## Personal Mention

(*Continued from page 14*)

gineer of standards and methods, succeeding Mr. Haney. Formerly assistant to engineer of car equipment.

**Charleston & Western Carolina.**—*Augusta, Ga.:* J. W. FLOWERS, superintendent, has assumed general supervision over transportation, mechanical and roadway departments, following the retirement of R. W. MARYE, general manager. Latter position abolished.

**Chicago, Milwaukee, St. Paul & Pacific.**—*Milwaukee:* A. W. HALLENBERG, appointed district master mechanic, succeeding A. M. HAGEN, retired. *Chicago:* W. C. GAGE appointed division master mechanic, succeeding Mr. Hallenberg. *Savanna, Ill.:* D. A. RADABAUGH appointed master mechanic, succeeding W. W. HENDERSON, retired. Formerly general foreman at Tacoma, Wash.

**Chicago & North Western.**—*Chicago:* D. R. WHITENIGHT, JR., appointed mechanical inspector—car. *Clinton, Iowa:* VITO FILITTI appointed assistant chief mechanical engineer.

**Missouri Pacific.**—*Dupo, Ill.:* M. H. LOSCH, master mechanic, retired.

**New York Central.**—*Collinwood, Ohio:* GORDON L. ZEIDER appointed superintendent, diesel locomotive shop, succeeding I. W. MARTIN, retired. *New York:* ROBERT W. MUSTARD appointed mechanical superintendent. Formerly master mechanic, Collinwood, Ohio.

**Southern.**—*Charleston, S. C.:* WILBUR D. SHULTS appointed master mechanic. *Alexandria, Va.:* GEORGE V. STRAYHORNE appointed master mechanic, succeeding Mr. Shults. *Knoxville, Tenn.:* DAVID W. PIPPINGER appointed general foreman at Coster Shop, succeeding Mr. Strayhorne. *Spartanburg, S. C.:* CHARLES E. SHAW appointed tools and methods engineer at Hayne Shop, succeeding Mr. Pippinger.

## Supply Trade Notes

ALCO PRODUCTS, INC.—*Stanley E. Lodge*, director of training programs since 1955, has left for Sidney, Australia, where he will work with the *A. E. Goodwin Company*, Alco's licensee, in the expansion of its diesel-locomotive manufacturing operations. Mr. Lodge, who taught diesel-locomotive operation and maintenance at the former Alco school for 11 years, expects to be located in India as Alco's Middle East representative upon completion of his Australian assignment.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Wilson H. Moriarty*, first vice-president, has been appointed also chief executive officer of the newly formed Railway and Mine Division. This division in-

(*Continued on page 58*)

# How much can you save? Use this table and find out!

This table, based on a fleet of 100 diesel and electric units, will aid you in figuring how much Standard's Wheel Truing Machine could save you.

## WHEEL TRUING MACHINE SAVINGS ANALYSIS

**AVERAGE 100 UNIT FLEET**

| | |
|---|---|
| Total pairs of wheels in Service | 432 |
| Average mileage 1 unit 1 month | 9,500 |
| Average mileage between wheel turnings | 57,000 |

| DIRECT SAVINGS | Lathe Method | Wheel Truing Method |
|---|---|---|
| Wheel pairs changed annually | 736 | 164 |
| Wheel Turnings per wheel life | 2.5 | 3.5 |
| Wheel pairs turned annually | 526 | 572 |
| Labor and Tooling cost per pair wheels turned | $73 | $14 |
| Total Annual Cost | $38,398 | $8,008 |
| SAVINGS | $30,390 | |
| New Wheels purchased annually | 210 | 164 |
| New Wheel Cost @ $368 | $77,280 | $60,352 |
| SAVINGS | $16,928 | |
| **TOTAL DIRECT ANNUAL SAVINGS** | | **$47,318** |

| MAJOR INVENTORY REDUCTION | Lathe Method | Wheel Truing Method |
|---|---|---|
| Wheel, Axle & Bearing Assemblies | | |
| No. wheels changed annually | 736 | 164 |
| Minimum Inventory—30 day supply | 61 | 14 |
| Value @ $2,145 each | $130,845 | $30,030 |
| **INVENTORY REDUCTION** | | **$100,815** |

Our representatives will supply facts behind these and other studies. For immediate information, write to: WHEEL TRUING, Standard Railway Equipment, 200 South Michigan Avenue, Chicago 4, Illinois.

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cludes plants at Sharon, Pa., and Melrose Park, Ill.; the Technical Center in Cleveland, and International Operations. *Stowell C. Wasson,* corporate vice-president, is responsible for various staff services, including metallurgical research and process development. *B. C. Yearley,* who is associated with Mr. Wasson, will be assistant vice-president. Other officers of the division are *Mellor W. Stevenson,* vice-president, sales; *Kenneth Selby,* vice-president, engineering, and *John F. Hutson,* assistant vice-president, sales, Chicago.

■

GENERAL ELECTRIC COMPANY.—Facilities for completely overhauling and rebuilding industrial locomotives of up to 120 tons and 1,000 hp have been set up at New York, Pittsburgh, Cleveland, Dallas, San Francisco, Atlanta, Salt Lake City, Boston, Chicago, Minneapolis, and Portland, Ore. In 37 additional cities, other GE service shops are equipped for some phase of locomotive repair or inspection, although, in the smaller shops, this may be limited to emergency field work. The major repair centers can complete a locomotive overhaul in four to six weeks, according to Howard F. McCullough, manager of GE's Service Shop Department, who announced the opening of the service on April 10. Doubling the useful life of the locomotive, the overhaul is said to cost only 20 to 40 per cent as much as a new locomotive of the same size and horsepower rating.

■

DEVILBISS COMPANY. — Northeastern headquarters have been moved from Newark to a new building at 10 Stern avenue, Springfield, N.J. The new branch has more than 11,000 sq. ft of floor space. It includes a testing and demonstration area, repair, rebuilding and exchange center, and sales, engineering and administrative offices for DeVilbiss and its newly acquired subsidiary, Newcomb-Detroit Company (now *Newcomb-DeVilbiss Company*), designers and manufacturers of industrial finishing equipment. *C. B. Gracely,* Northeastern Regional sales manager, is in charge. The Milwaukee sales office of Devilbiss has been moved from 833 East Kilbourne avenue to 6915 West Capitol Drive.

■

AIR REDUCTION COMPANY, AIR REDUCTION SALES COMPANY DIVISION. — *N. F. Moody* has been appointed district manager at Philadelphia, and *H. F. Colt, Jr.,* district manager at Boston.

■

LINDE COMPANY. *Robert H. Bennewitz,* southwestern region manager of engineering service at Kansas City, Mo., has been appointed assistant manager, railroad department, at Chicago.

WESTINGHOUSE AIR BRAKE COMPANY, AIR BRAKE DIVISION.—*C. F. Hammer,* director of engineering, has been appointed vice-president—engineering.

■

ACF INDUSTRIES, AMERICAN CAR & FOUNDRY DIVISION.—*Charles F. Venrick,* sales vice-president, western region, has been appointed vice-president in charge of railway sales, with headquarters in Chicago.

■

E. R. Hauer

SPERRY RAIL SERVICE.—*E. R. Hauer has* been appointed consultant on railroad applications of ultrasonic testing. Mr. Hauer recently retired as general mechanical engineer of the Chesapeake & Ohio. *Richard Y. Neiley* has been appointed district sales supervisor, with headquarters in Chicago.

■

WAUGH EQUIPMENT COMPANY; EVANS PRODUCTS COMPANY.—Manufacturing and sales rights and patents to *Southern Pacific's* "Hydra-Cushion Underframe" for freight cars have been sold to the Waugh Equipment Company of New York and the Evans Products Company of Plymouth, Mich., who will jointly manufacture and sell the device.

■

AMERICAN AIR FILTER COMPANY.—*William Peters* has been appointed manager of the New York City branch office. Mr. Peters was formerly assistant general sales manager of the Anemostat Corporation.

■

SHERWIN-WILLIAMS COMPANY.—*Gordon K. Sell* has been appointed transportation representative in the Philadelphia area, succeeding *George E. Smith,* retired. Mr. Shell, who was previously technical coordinator, transportation division, will be located at 325 North Broad street, Philadelphia.

■

DUFF-NORTON COMPANY.—*T. B. Peterson* has been appointed district sales manager for the Duff-Norton Jack Division and the Coffing Hoist Division in northern Cali-

(*Continued on page 60*)

One of the most extensive railroad machine shops is that of the Norfolk and Western at Roanoke. The above photos were taken in the Wheel Shop.

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Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

BALDWIN BLH LIMA-HAMILTON

# WHO'S WHO IN BRUSHES . . .

**BIOGRAPHICAL EXCERPTS OF CERTAIN WELL-KNOWN DIESEL-ELECTRIC BRUSH PERSONALITIES YOU MIGHT LIKE TO MEET . . . *and some you wouldn't***

**WEAREVER McHARD**

Old Wearever has been fighting it out with commutators ever since he was knee high. Fact is, he hates 'em like poison because his pappy taught him long ago that it was either their hides or his'n. Wearever's durability is clearly attested by the fact that he is still living lustily . . . whereas a lot of commutators with which he has been associated have been laid up for extensive hospitalization. Old Wearever is as hard as they come. He's got grit, too. In fact, some folks claim he'd have more friends if he softened up a bit, acquired a little humility and learned to cooperate with commutators instead of battling 'em.

**JUSTA SOFTIE**

Justa would have a better reputation if she wasn't such a pushover . . . for commutators, that is. No one ever told her that even perfectly well-bred commutators might be quick to take advantage of a weakness like that. Poor Justa! Not very strong to begin with, she tries to be so accommodating that, just when her affairs ought to be whirling smoothly along, she's apt to be plumb worn out. Of course she can be replaced, but some diesel men rightfully complain that this is a lot of unnecessary bother . . . and expensive besides.

**THE STACKPOLE BRUSH FAMILY**

The word "adaptable" best describes this rather remarkable clan. Take ole Uncle Happy Medium Stackpole, for instance. He's hard but not too hard, soft but not too soft. For years, he's been a kissin' neighbor to a whole flock of commutators. Gets along with 'em smooth as molasses. Quicker'n you can say "no bar-burning," he flips a film on commutator surfaces. What's more, he keeps it there over long mileage schedules and under mighty trying conditions. No need for frequent and costly commutator "reconditioning" when he's on the job. That's why Uncle Happy is honorary president of S.P.C.C. which, in case you've forgotten, is the Society for Prevention of Cruelty to Commutators. Uncle Happy's pretty proud of his achievement. So are we!

**STACKPOLE**
*diesel-electric*
**BRUSHES**

STACKPOLE CARBON COMPANY • *St. Marys, Pa.*


fornia, Nevada, Oregon, Washington and western Idaho, with headquarters in San Francisco. *Donald A. Anderson* has been appointed district sales manager, covering New York State and New England.

■

AMERICAN HOIST & DERRICK COMPANY.—*Richard J. Mills,* regional manager, Eastern district, has been appointed general sales manager.

■

K. W. BATTERY COMPANY.—*Robert T. Rinehart,* midwest regional sales manager, has been appointed eastern regional sales manager. *Donald R. Wickman* has been appointed sales representative for KW batteries in western Pennsylvania, West Virginia, southeastern Ohio, and part of Maryland, with headquarters in Pittsburgh.

■

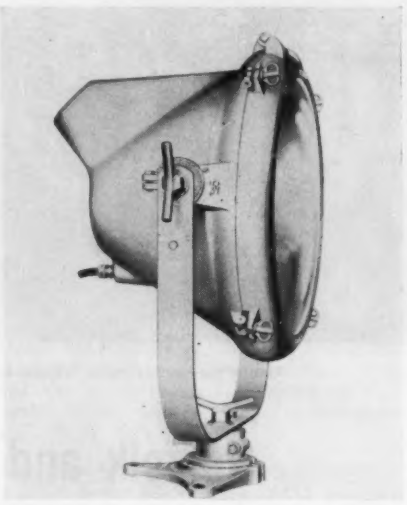
DAYTON RUBBER COMPANY.—*Robert G. Burson* has been appointed assistant general sales manager, Mechanical Goods Division.

■

WILSON ENGINEERING CORPORATION. —*John T. Hultgren* has been appointed railroad representative in the Twin Cities and Duluth areas.

## What's New

(*Continued from page 18*)



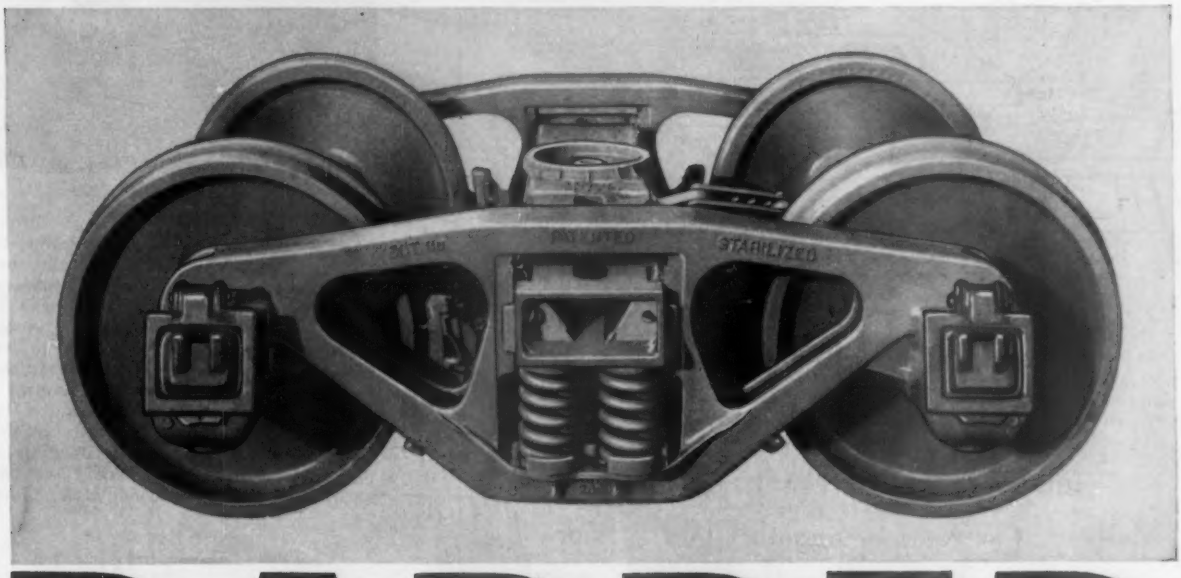
### Mercury Vapor Floodlights

These heavy duty, cast aluminum floodlight housings are designed especially for mercury vapor lamps. They have the same dust- and moisture-proof characteristics as the incandescent models and are available in sizes from a 10-in. model for 250-watt lamps on up to 20 and 23-in. housings for 700 and 1,000-watt mercury vapor lamps. Models are available with two types of reflectors and three to five types of lenses.

Because of the voltages encountered with mercury vapor lamps, the porcelain lamp

(*Continued on page 62*)

# MODERN FREIGHT CARS BEGIN WITH

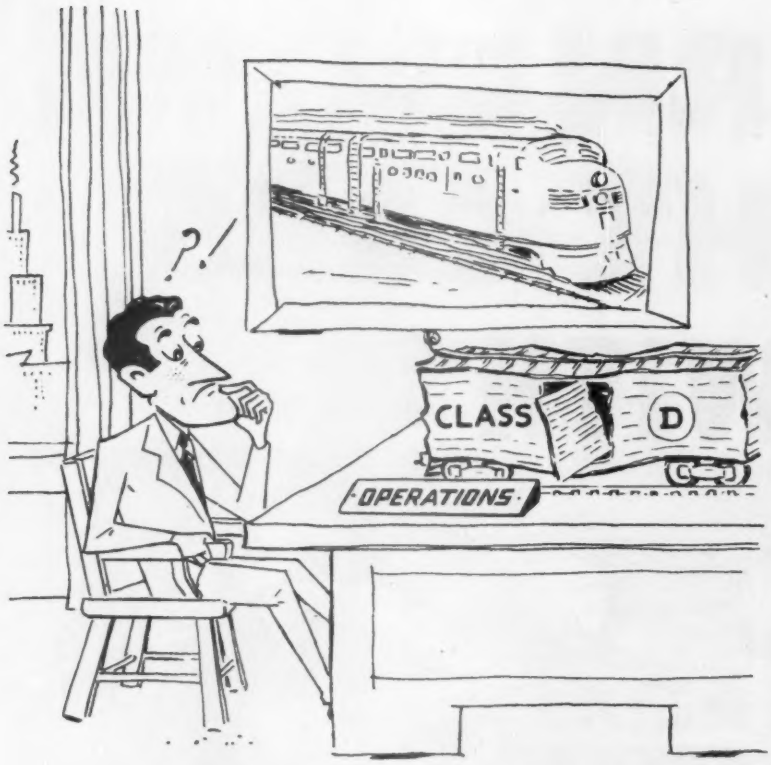



# BARBER

## STABILIZED TRUCKS

**MORE THAN 475,000 CAR SETS OF SM-O-O-O-O-THER RIDING BARBER STABILIZED TRUCKS SOLD**

Standard Car Truck Company, 332 S. Michigan Ave., Chicago 4, Illinois.
*In Canada:* Consolidated Equipment Company, Ltd., Montreal 2, Quebec.




For the car "too-humped-to-help", most any upgrading is too costly. But where B and C cars must be made Class A and funds are limited, PLASTINAIL offers this:

1 — A super-smooth Class A floor

2 — That will outlast a new wood floor and remain in Class A service virtually all its life

3 — At as little as 2/3 the cost* of new wood.

*PLASTINAIL for 3/4" coverage of a 40'-6" box car is only $138.

Installation time: approximately 20 man-hours.

Write, wire or phone for details

Plastinail*

OXYCHLORIDE CEMENT BOX CAR FLOORS

*Reg. T. M. of F. E. Schundler & Co., Inc.

F. E. SCHUNDLER & CO., INC., 504 Railroad St., Joliet, Ill.

receptacle cuts out automatically during lamp replacement, removing voltage from the exposed socket. Cords, when provided, are three-conductor type to permit grounding. *Pyle-National Company, Dept. RLC, 1334 N. Kostner ave., Chicago 51.*

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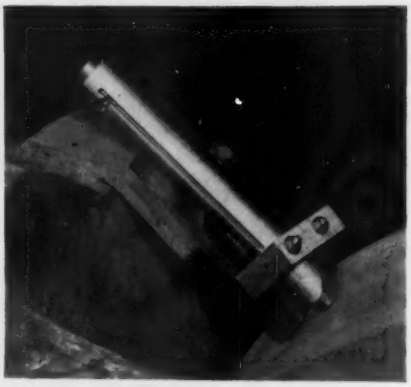

## Flange Lubricator

The Nalco improved flange lubricator, type TA, features a swivel mounting eliminating clearance problems and permits replacement of the dry molybdenum disulphide stick lubricant without removal of any part. According to the manufacturer, there is no interference with application of new brake shoes from top wheel position. Adjustment of guide shoe is simplified and positive, and the suspension mounting prevents grabbing, chaffing, and applies lubricant smoothly and uniformly. *National Aluminate Corporation, Dept. RLC, 6216 West 66th place, Chicago 38.*

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## Huckbolt Collar

A flange-type collar for use with Huckbolt fasteners permits its use in over-size hole applications.

The 3LC collar also provides improved bearing in wood-to-metal, and wood-to-fiber applications. The flange eliminates any tendency to overswage during installation and prevents crushing, extruding, or deforming of the surfaces being joined. The new collar design is installed with standard Huck power tools.

(*Continued on page 64*)

# Here's a NEW WELDING TORCH that's WATERTIGHT... built for HEAVY-DUTY SERVICE ...yet weighs only 7 OUNCES!

This new HELIARC HW-18 Hand Welding Torch weighs only 7 ounces, making it easy for you to handle, less tiring. The special one-piece water cooling channel eliminates sources of leakage. And it's made for rugged, heavy-duty service.

**YOU GET BETTER SHIELDING WITH LESS GAS**

Improved design of collet body and closer electrode fit assure uniform argon flow, without jetting or turbulence.



◀ Diagram shows leakproof, one-piece water cooling passage in LINDE's new HELIARC HW-18 Hand Welding Torch.

**GIVES YOU RUGGED SERVICE**

Torch body is Fiberglas-reinforced phenolic for greater resistance to heat and thermal shock. Handle is tough, polished plastic. Gas cups have 4 times the impact strength of ordinary cups.

**LEAKPROOF**

Molded, one-piece water cooling passage has no joints to permit leakage—no water drip to contaminate welds.

**EASY, MORE ECONOMICAL MAINTENANCE**

Collets, collet bodies, cups and caps are interchangeable with those of your HW-17 Series 2 Torch. All couplings have standard IAA connections, and adaptors are included. Your production costs are lowered, too, for the new HW-18 saves time in hard-to-reach spots. Torch is designed for continuous 300-amp service, a-c or d-c.

**ARGON SHUT-OFF VALVE**

(Optional) saves time, steps and argon.

*For the best in electric welding ...look to LINDE*

RAILROAD DEPARTMENT

Linde TRADE-MARK UNION CARBIDE

The terms "Heliarc," "Linde," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

See and try the new HELIARC HW-18 Torch! Call your LINDE representative today, or write: Railroad Department, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

# Oakite Mechanized Methods force cleaning costs ...DOWN ...DOWN ...DOWN

**... gives you the important advantage ...**

***low-cost end results***

If your cleaning practices have kept pace with modern motive power, it's certain they're mechanized. Why? Well, one road spent $5,200 to clean 135 tank cars manually. When they mechanized the job with an Oakite 324 Cleaning Unit, they got faster turnaround, used less material, *saved $1,600.*

Latest materials help, too. A road saved $2,600 *a month* in car-washing costs by up-dating with Oakite Compound No. 88. *And,* they got better, non-streak cleaning ... on windows, too.

At one terminal, an Oakite Steam Detergent Gun and Composition No. 72 slashed monthly consumption of material for cleaning diesel interiors from 1,200 pounds to 337 pounds, cut *cost* per month from $144 to $57.63.

Beginning to suspect that a review of your cleaning methods and materials could save you money? Then call in the local Oakite man. Or, write for the Oakite *Manual of Railroad Maintenance Cleaning Procedures.* Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

*In our 50th year*


It covers a range of sizes for use with 3/16-in., 17/64-in., 5/16-in., 3/8-in., and 17/32-in. nominal Huckbolt pin diameters. Flange diameters for these sizes are 3/8 to 1 in. *Huck Manufacturing Company, Dept. RLC, 2480 Bellevue ave., Detroit 7.*

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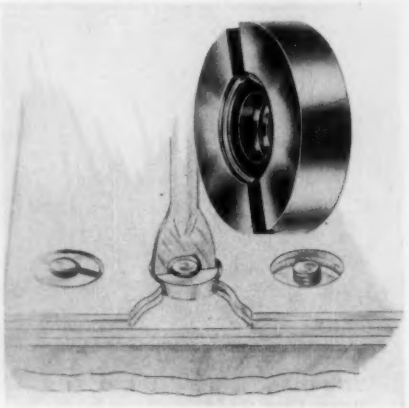

## Self-Locking Panel Nut

This self-locking nut, designed to simplify installation, replacement and maintenance of interior wooden panels in freight cars, mounts flush with the panel surface. The ESNA panel nut can be installed or removed by using a standard double-bladed screw-driver type tool in a hand power unit. The blades of the screw driver tool fit the .125-in. wide slots in the face of the nut and provide the wrenching action. The nylon locking insert keeps the panel nut from loosening on the bolt despite possible loss of bolt tension due to shrinkage or compression of the wood panels. It also holds the fastener in place under the most severe vibration conditions. The Type 3017 fastener can be reused and is made of carbon steel with 3/8-16 threads. It is 1-in. in diameter and .265-in. thick. *Elastic Stop Nut Corporation of America, Dept. RLC, 2330 Vauxhall Rd., Union, N. J.*

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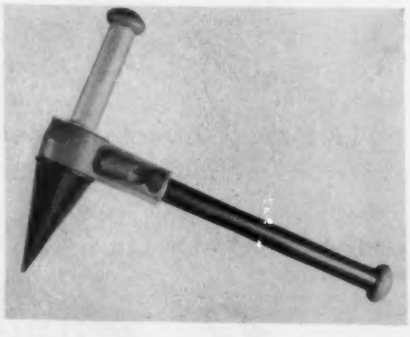
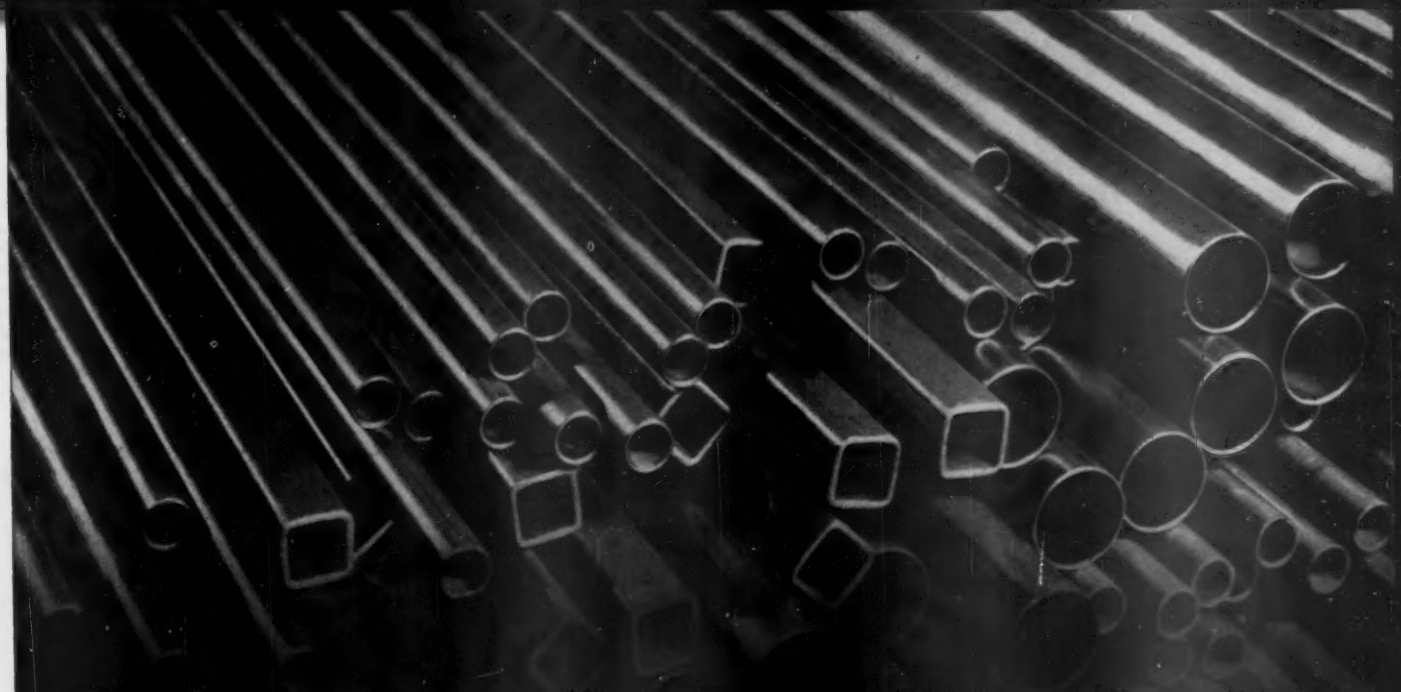


## Ratchet Reamer

Ratchet pipe reamer No. 182 is said to be especially effective for small pipe. Its 7-flute arrangement is designed for faster reaming, while at the same time eliminating gouging.

(*Continued on page 66*)



# Need Seamless Steel Tubing Immediately?

## Get "out-of-stock" delivery Call your USS Shelby Seamless Distributor!

WHY WAIT FOR DELIVERY when you can get all the top-quality Seamless Steel Tubing you need from your close-at-hand USS Shelby Seamless distributor?

Phone him, write him, drop in and see him—and you'll get prompt, courteous and efficient service, the likes of which you've never seen before.

• The consistent high quality of USS Shelby Seamless Tubing, its dimensional accuracy and superior machining characteristics make it easy to fabricate. Use it and cut tool costs, reduce rejects, save both time and money, and turn out a finer product.

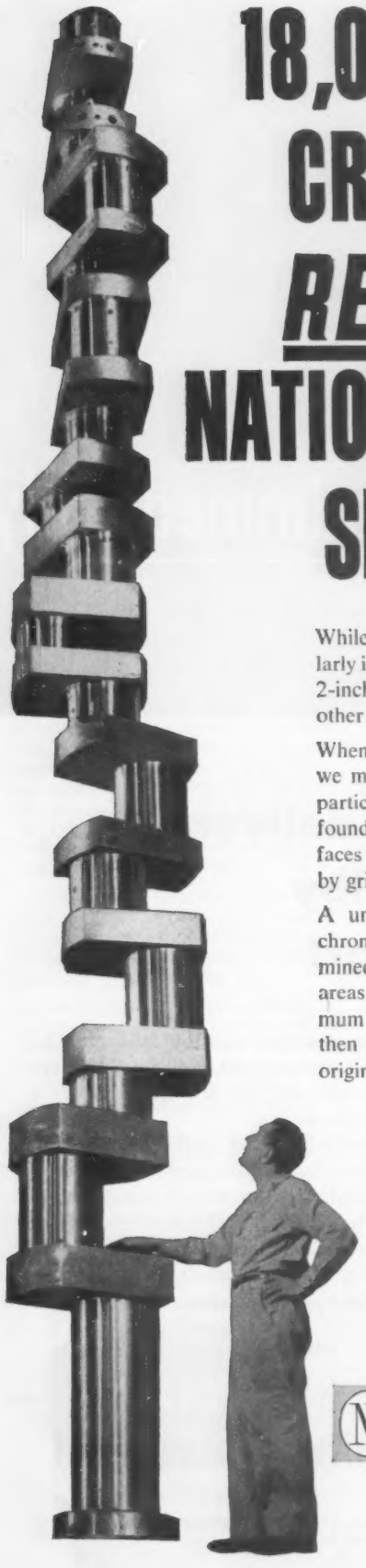
• Shelby Seamless is available in round, square, rectangular, and other special shapes in any commercial size—from ¼" OD to 10¾" OD and in wall thicknesses from .035" to 2.000" . . . in a wide range of steel grades and anneals.

**— Contact your Shelby Seamless Distributor now! —**

*USS and Shelby are registered trademarks*

**National Tube Division of USS United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Supply Division
United States Steel Export Company, New York



# 18,000 POUND CRANKSHAFT *REBUILT* BY NATIONAL FORGE SPECIALISTS

While National Forge specializes particularly in locomotive crankshafts, this 23-foot 2-inch compressor crankshaft was just another routine reconditioning job.

When this shaft arrived at National Forge, we made a thorough visual and magnetic particle inspection. After the shaft was found to be salvageable, all the bearing surfaces were prepared for chromium plating by grinding and grit blasting.

A unique plating machine deposits the chrome uniformly smooth to a pre-determined thickness—and away from fillet areas. After re-grinding—held to a minimum by accurate plating—the shaft was then finished ground and polished to the original specifications.

No other plating company has National Forge's experience in handling both new and rebuilt crankshafts. So, why not try National Forge Specialists on your next crankshaft rebuilding job?

*Write for Bulletin RC-1.*

NATIONAL FORGE & ORDNANCE COMPANY
IRVINE, WARREN COUNTY, PA.


It is easily resharpened and has a pipe capacity of ⅛ to 2 in. A modified vise stand, now available, has mounting holes for most popular-make vises, and elastic stop nuts for all fastened elements. A new and more versatile steel tray is claimed to positively prevent folding of this Model 8A while in use. *Toledo Pipe Threading Machine Company, Dept. RLC, 1445 Summit Street, Toledo 4, Ohio.*

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## Grounded Portable Lights

This portable lighting unit can provide 200 to 400 watts of grounded illumination at 6, 12 or 32 volts, from conventional 110/120 volts a-c power sources. Reported to be safe for use around metal structures, even in dripping wet conditions, it has of a circuit-breaker protected "step-down" transformer housed in a moisture-tight cast aluminum case. One to four handlamp extensions plug into receptacles on each end of the carrying case.

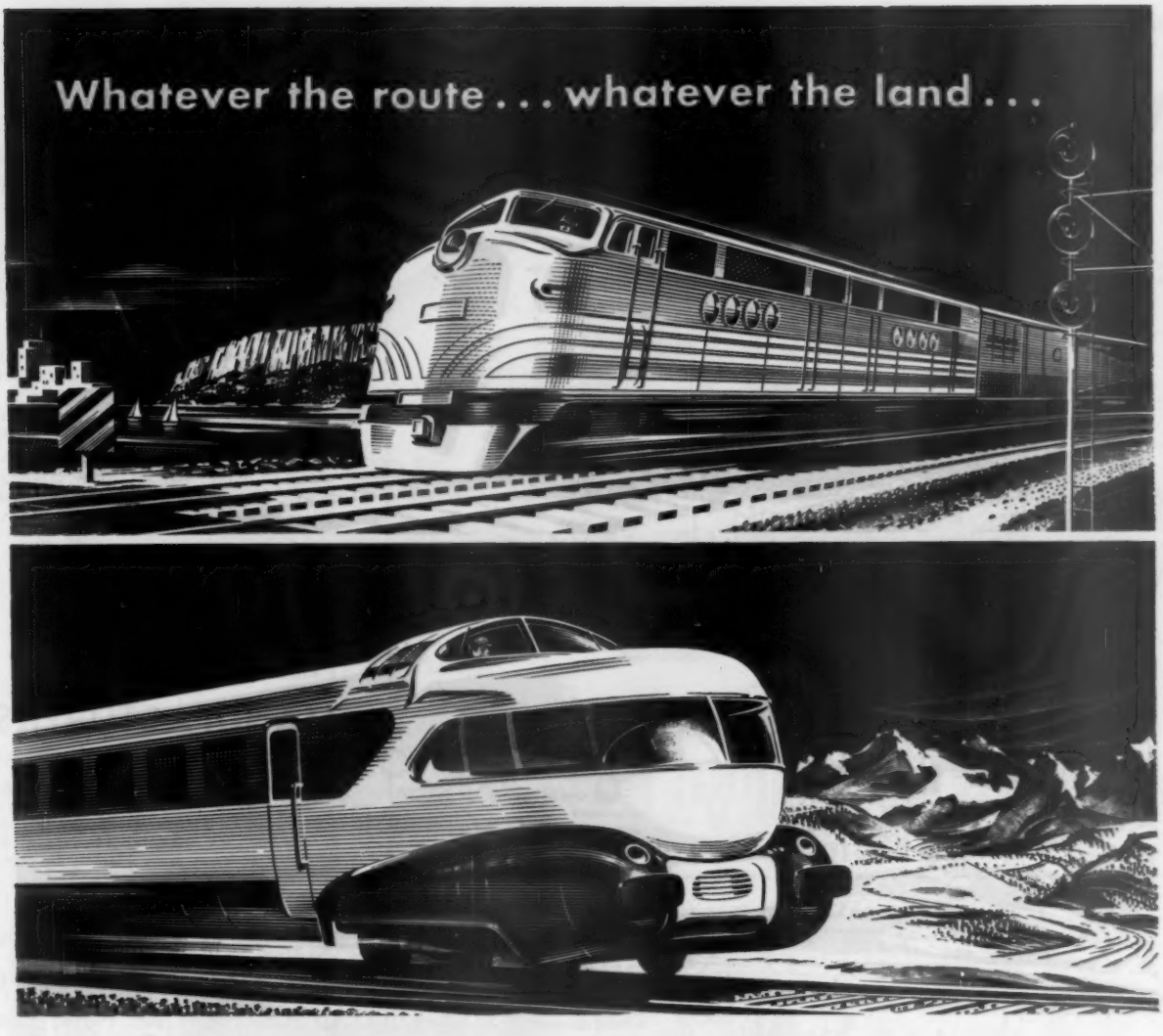
The unit is supplied with a 6-ft power extension with male end plug that connects to conventional three-contact grounded female receptacles. The third wire in each extension connects ground to the transformer case and to the metal lamp guards. Handlamps accommodate screw-in style medium base bulbs —50 and 75-watt for 8 and 12 volt sets, and 50 and 100-watt sizes for 32 volt sets. *Dept. V-130, Joy Manufacturing Company, 1201 Macklind Ave., St. Louis 10.*

---

## Running Board

The new improved one-piece Morton "Uni-Wing" Open-Grip Type III running board features redesigned side flanges for each side of the longitudinal board. A single die forming operation presses the flanges and rivet application pads from the flanges, eliminating weld-on brackets which would loosen if weld was defective. Improved edge forming of the lateral board eliminates welding on brackets to join this board to the long board. Material is 13-gage mild steel, hot-dip galvanized after fabrication. The open-grip debossings

(*Continued on page 68*)




104-S

# Its performance and name are the same around the world

**Other Outstanding Shell Industrial Lubricants**

**Shell Tellus Oils**—for closed hydraulic systems
**Shell Alvania Grease**—multi-purpose industrial grease
**Shell Rimula Oils**—for heavy-duty diesel engines
**Shell Turbo Oils**—for utility, industrial and marine turbines
**Shell Dromus Oils**—soluble cutting oils for high-production metal working
**Shell Macoma Oils**—for extreme pressure industrial gear lubrication
**Shell Voluta Oils**—for high-speed quenching with maximum stability

Shell Talona R Oil 40 offers two outstanding reasons for its acceptance as a top-rated diesel-electric locomotive lubricant: (1) It provides superior anti-wear protection. (2) It maintains engine performance at its peak.

Greatly reduced wear on pistons, rings and cylinder liners is assured because of the selected combination of additives used in Talona® R Oil 40. It has high oxidation stability, combined with resistance to corrosion and sludge formation. It prevents ring fouling and provides excellent detergent-dispersant action.

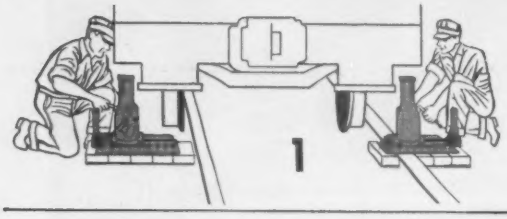
Today—railroad operators abroad can enjoy the same Talona R Oil 40 that domestic carriers rely upon. For complete information, write to Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

## SHELL TALONA R OIL 40

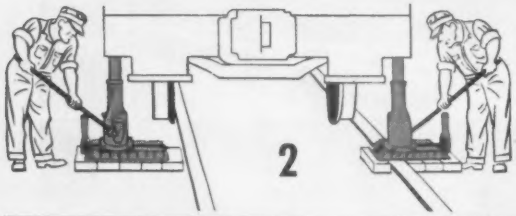
SHELL

*How to get back on the track quickly*

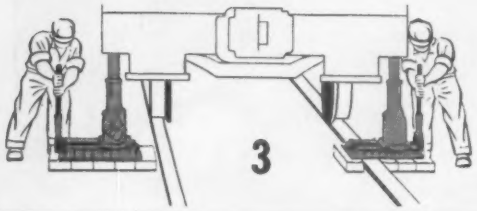
**Without A Crane!**



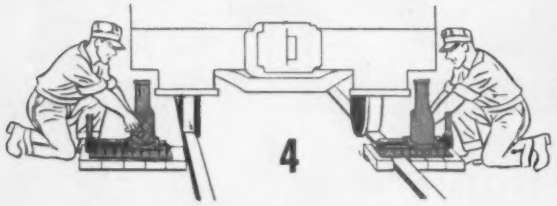

Place a *Duff-Norton traversing base* and jack beside each derailed truck.




Jack up the car or locomotive until wheels clear top of rails.

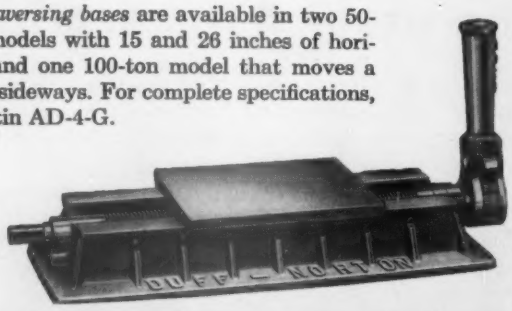



Move jacks horizontally simultaneously on traversing bases until wheels are in alignment with rails.




Lower wheels; you are back on the track, quickly, inexpensively and without danger of distorting car or locomotive frame.

*Duff-Norton traversing bases* are available in two 50-ton capacity models with 15 and 26 inches of horizontal travel and one 100-ton model that moves a load 20 inches sideways. For complete specifications, write for bulletin AD-4-G.




**DUFF-NORTON COMPANY**

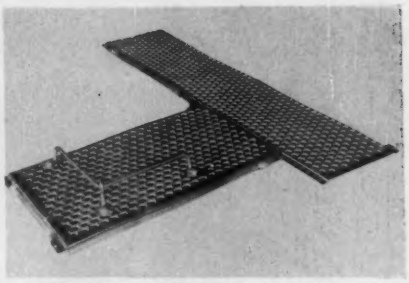
P. O. Box 1889 • Pittsburgh 30, Pennsylvania

**COFFING HOIST DIVISION** • Danville, Illinois

**DUFF-NORTON JACKS**
Ratchet, Screw,
Hydraulic, Worm Gear

DUFF-NORTON

**COFFING HOISTS**
Ratchet Lever
Chain, Electric

provide required snow clearance area. Raised Kass buttons around the debossings provide gripping action and do not lose safety features through wear.

According to the manufacturer, the one-piece construction is stronger and the die-formed accuracy of the design makes it easier to apply, *Morton Manufacturing Company, Dept. RLC, 5125 West Lake st., Chicago 44.*

# HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information write direct to the manufacturer.

TRIPLE HOPPER CAR.—8-page bulletin (GV-1) contains general arrangement drawing and complete information on new Greenville automatically welded 70-ton GV-1 package triple hopper car. (Write: *Greenville Steel Car Company,* Dept. RLC, Greenville, Pa.)

HYDRAULIC PULL TOOLS.—8-page catalog (Form 8-420) describes hydraulic pull tools for installing Huckbolt fasteners and blind rivets. Lists hydraulic pull tool nomenclature and describes in detail each of three basic units available from Huck. Standard Huck power cell and Huck power pack also mentioned. (Write: *Huck Manufacturing Company,* Dept. RLC, 2480 Bellevue ave., Detroit 7.)

INDUSTRIAL BATTERIES.—New edition of C & D General Service Manual gives data on industrial batteries on cycle service, including industrial truck, railroad diesel starting, car lighting and air conditioning, etc. Includes charts, tables, methods of repair, instructions covering repairs with special or regular tools, simplified testing methods, and instruction on correct charging methods. (Write: *Advertising Department, C & D Batteries, Inc.,* Dept. RLC, Conshohocken, Pa.)

GEARED-HEAD LATHES.—32-page Bulletin No. 1216 describes construction, design, and operating features of Betts heavy-duty

(*Continued on page 70*)

## A Cut Above Average

A. Taper Bridge Reamer (Straight Flute)

B. Taper Bridge Reamer (Spiral Flute)

C. Car Reamer (Straight Flute)

High grade small tools perfected through years of specialization.

BRIDGE REAMERS
CAR REAMERS
MUD RING REAMERS
EXTENSION REAMERS
COUNTERSINKS
LOCOMOTIVE REAMERS
HAND REAMERS
JOBBERS REAMERS
CHUCKING REAMERS
SHELL REAMERS
PIN REAMERS
DRILLS
RIVET SETS
SPECIAL REAMERS

**WAYNE TOOL CO.**
**Waynesboro, Pa.**

SMALL W TOOLS



**America's foremost engineered lettering tools**

designed to reduce your present costs
**50 to 80%**
Used today by 1/3rd of the Nation's leading Railroads . .

DN

*Spray it*®
**STENCILS**
PRESSURE SENSITIVE TYPES

Easy to apply. No skill required. Produces the most accurate and durable type of lettering, numerals, medallion, and other types of markings. Adds long life to your identification or advertising on all your equipment . . .

Whatever your lettering problems may be regarding identification, advertising, reflective or non-reflective, the DEMP-NOCK LETTERING SYSTEMS can help you get the job done in less time.

For additional information write Dept. RR-100
**THE DEMP·NOCK COMPANY**
21433 MOUND ROAD • VAN DYKE, MICHIGAN • U.S.A.

DEMP NOCK

# DIESEL MAGNUSOL NOW STANDARD CLEANER ON LEADING RAILROADS...

**. . . Used On Large And Small Lines For 90% Of All Operating Diesels.**

Recognizing that the cleaning of diesel power units is one of the most important daily jobs faced by the Mechanical Department, it is impressive to note that DIESEL MAGNUSOL is the most widely used product for this job in the country.

**HERE ARE THE REASONS**

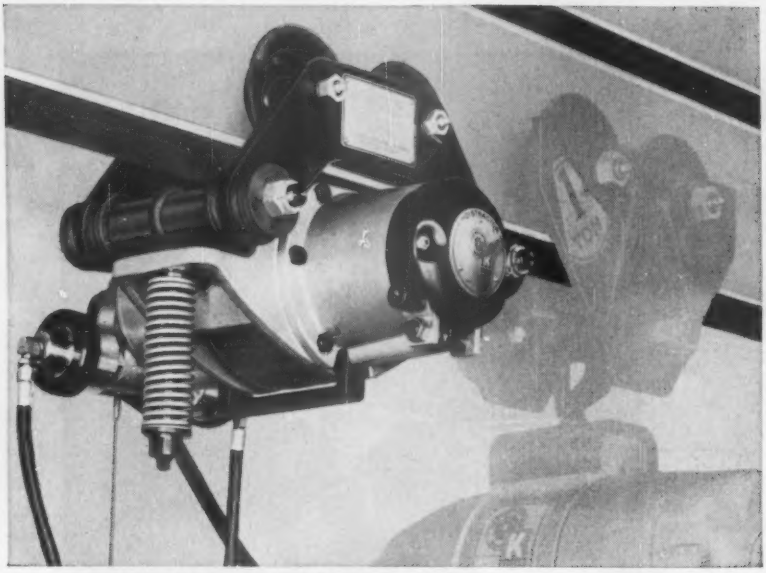
- Soluble in water or solvent, DIESEL MAGNUSOL quickly penetrates oil, dirt and grease accumulations.
- DIESEL MAGNUSOL is readily emulsified and flushed away with a pressure stream of water.
- DIESEL MAGNUSOL may be sprayed or brushed on.
- Safe for skin, metals, or good paints and varnishes, DIESEL MAGNUSOL is non-toxic and has no objectionable odor.

**AND it is ECONOMICAL!**

For most applications DIESEL MAGNUSOL is used at a rate of one part to eight parts of kerosene or diesel distillate. Moreover, for those who object to the use of a solvent inside a diesel or those facing drainage problems, DIESEL MAGNUSOL may be diluted with water in a one to five parts water ratio with good effectiveness.

For free, full information on this modern Magnus method of diesel power cleaning, write to Magnus, 77 South Avenue, Grawood, New Jersey.

RAILROAD DIVISION
**magnus**
CHEMICAL COMPANY INC.
magnus a world-wide organization specializing in cleaning and protection of all surfaces.



## Now, push-pull power with new

# HOISTRACTOR

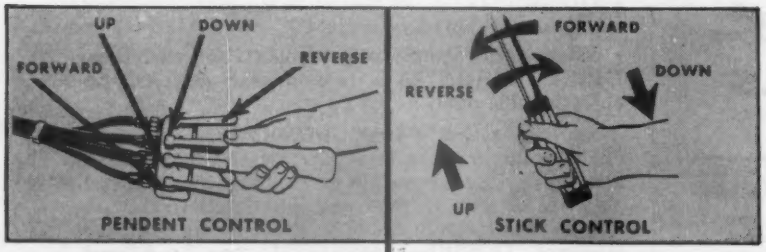
Now, it's an easy one-man, one-hand operation to raise, lower or move loads up to two tons. Simply use the new Keller "Hoistractor." This air-powered hoist trolley, connected to any beam hoist by a drawbar, rides the same beam as the hoist. Hoist lifts and lowers . . . "Hoistractor" moves hoist and load along the beam.

## New HOISTRACTOR features

- Fast, safe movement of heavy loads—without operator fatigue.
- Speed variable from slow creep to full-load speed of 70 ft. per min.
- Axial-piston air motor exerts 250-lb. drawbar pull on beam.
- Sensitive air controls permit smooth acceleration and deceleration . . . accurate load spotting.
- Easily adjusted mechanical brake for positive stopping. Brake, not dependent on air supply, is applied automatically in event of air line failure.

Write for Bulletin 87-1.

## ONE HAND CONTROL—two types available

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geared-head lathes, 48 in. to 144 in. and larger. Specifications included for each size. (Write: *Consolidated Machine Tool Division, Farrel-Birmingham Company,* Dept. RLC, 565 Blossom Road, Rochester 10, N. Y.)

FIRE PROTECTION.—"Fire Protection Service Plan" points out how to protect against damaging fire loss and emphasizes need for fire-fighting training and fire-prevention planning, and explains "plus" services available to users of Ansul equipment. (Write: *J. R. West, technical services director, Ansul Chemical Company,* Dept. RCL. Marinette, Wis.)

WELDIRECTORY.—12-page weldirectory tells how to select the most efficient electrode for any particular welding job. Describes basic characteristics of Fast Freeze, Fast Fill, and Fill Freeze electrodes, also physical properties, current ranges, sizes and welding procedures for each. Wall chart contains frequently used information about Lincoln electrodes. (Write: *Lincoln Electric Company,* Dept. RLC, Cleveland 17.)

ARMATURE BANDING TAPES. Bulletin RE65-1 gives technical information on properties and application of RES-I-GLAS tapes for diesel armatures and generators, transformers, etc. Discusses also methods of balancing on the band. (Write: *Chicago Printed String Company,* Dept. RLC, 225 Fifth ave., New York 10.)

LADDERS. 20-page booklet illustrates 35 new models of pyramid design step ladders for working heights up to 15 ft. Gives detailed specifications and shows typical uses. Describes also other Ballymore ladders, hydraulic lifts and fixed of adjustable-level work platforms. (Write: *Ballymore Company,* Dept. RLC, West Chester, Pa.)

AIR BRAKE FITTINGS. 4-page, Form No. 556 lists advantages of Dresser air brake fittings for railroad cars over other joint or pipe joining method. Describes salient features of fittings, seals, cups, with illustrations of typical applications. (Write: *Dresser Manufacturing Company,* Dept. RLC, Bradford, Pa.)

ANTI-FRICTION BEARINGS. 32-page technical bulletin describes care and maintenance of anti-friction bearings. Subjects include oil and grease lubrication, frequency of re-lubrication, periodic cleaning, choosing bearing replacements, proper mounting procedures and causes of bearing failures. (Write: *Socony Mobil Oil Company, Railroad Division,* Dept. RLC, 59 East Van Buren st. Chicago 5.)

PIPE COUPLINGS AND FITTNGS. 10-page Form No. 1054-R contains line drawings and photographs showing coupling and fitting applications to fuel, lube, oil, water, air and vent lines on diesel locomotives. Charts give complete specifications. (Write: *Dresser Manufacturing Company,* Dept. RLC, Bradford, Pa.)

DIESEL FUEL OIL TREATMENT. 4-page folder describes Xzit diesel fuel-oil treatment, heavy diesel fuel-oil treatment, and economy diesel fuel-oil treatments and gives directions for their use. Describes also Xzit diesel lube oil, powdered diesel Xzit, degreasing solvents, and diesel cooling water treatment. (Write: *Xzit Chemical Company,* Dept. RLC, 158 14th st., Hoboken, N. J.)

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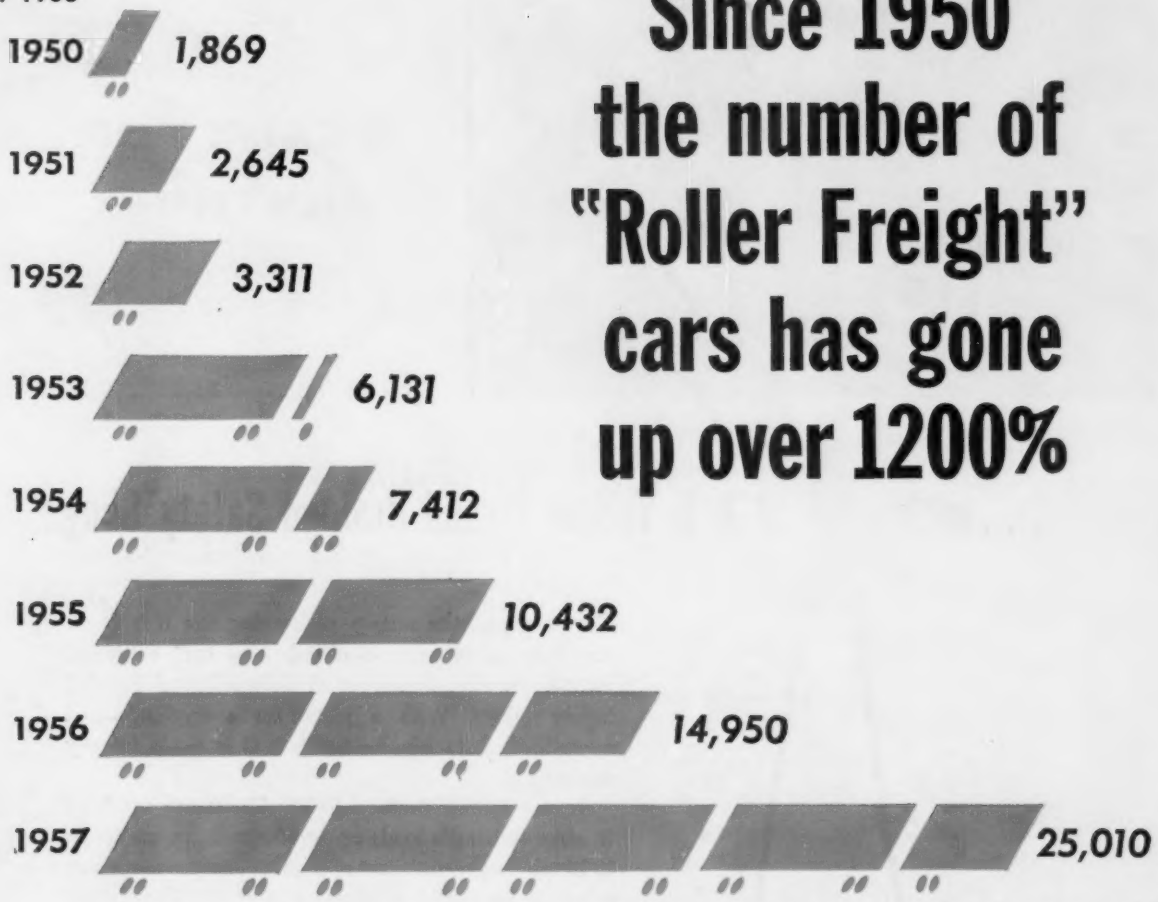


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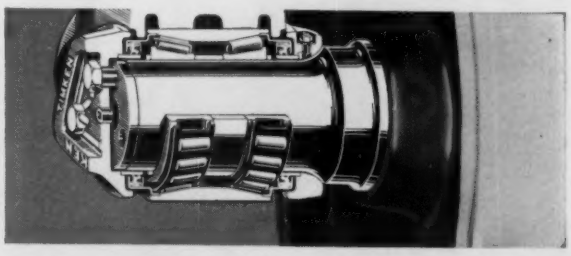

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